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MARKER GENERATOR

Model 7300

MANUAL # 110-6015

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SINGER
INSTRUMENTATION

INSTRUCTION MANUAL

MARKER GENERATOR

Model 7300

MANUAL # 110-6015

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INSTRUMENTATION

The Singer Company, Palo Alto Operation

3176 Porter Drive, Palo Alto, California 94304/ (415) 493-3231 TWX 910-373-1765

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Instruments should be returned only on prior written authorization from the Singer Representative or the factory(1). Please provide the following information in order to expedite our processing of your instrument:

1. Model or Type
2. Serial Number
3. Approximate date instrument was placed in operation
4. Approximate number of hours of use
5. Description of trouble(2)
6. Has maintenance action been previously requested?
7. Other comments

Upon receipt of this information our Service Department will send you service data or shipping instructions. Upon receipt of shipping instructions forward the instrument prepaid to the specified center or factory. If requested, an estimate of charges will be made before work begins.

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(2) Include data on symptoms, measurements taken, test instruments used, suspected location of trouble, maintenance action taken, and any other relevant data.

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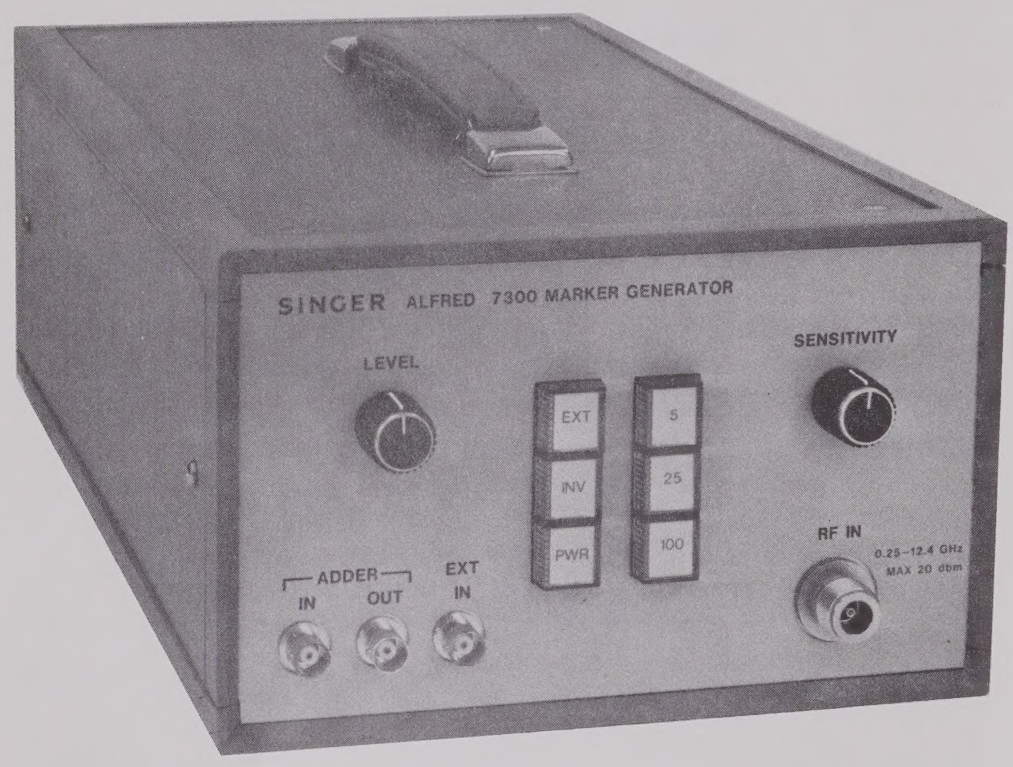


Figure 1-1. Model 7300 MARKER GENERATOR

SECTION I
GENERAL INFORMATION

1-1. DESCRIPTION

The Model 7300 Marker Generator produces frequency markers at precise intervals to aid the analysis of swept-frequency visual displays. The Model 7300 provides internally generated markers at 100-, 25- and 5- MHz intervals over the 5 MHz to 18 GHz range. Markers at 500 KHz to 2.5 MHz intervals can also be produced by an external trigger signal.

The 5-, 25- and 100- MHz markers are generated at progressively greater amplitudes to provide a "ruler-type" display that calibrates the frequency axis of the display with 0.0001% accuracy. By correlating the nearest 100 MHz marker with the dial setting of even a low-accuracy signal source, the desired frequency can be positively identified and read to a fraction of a MHz, using the appropriate marker pip.

The Marker Generator output may be applied independently to the display device or may be added to another signal before display (e.g., frequency markers from the sweep oscillator). The Model 7300 includes an adder circuit to permit the combining of the 7300 output with another signal via a front panel input terminal.

The illuminated-pushbutton front panel allows easy selection of marker interval, polarity and external-trigger operation. Front-panel controls are also provided to permit adjustment of marker amplitude and RF sensitivity.

Detailed specifications for the Model 7300 Marker Generator are given in Table 1-1.

1-2 . SCOPE OF MANUAL

This manual provides all information necessary to operate and maintain the Model 7300 Marker Generator. An addendum sheet may be included to provide updating information and corrections to errata. Backdating information also may be included in an Appendix to convert this manual to apply to older instrument versions.

TABLE 1-1. SPECIFICATIONS, MODEL 7300 MARKER GENERATOR

Frequency Range	250 MHz to 12.4 GHz, typically usable from 5 MHz to 18 GHz.
Frequency Markers	
Internal	100, 25 and 5 MHz simultaneous or independent; selected with pushbutton control.
Externally Triggered	0.5 to 2.5 MHz, triggered by external oscillator; 0.1 V to 1.0 V rms drive required; 600 ohms input impedance.
Amplitude	100, 25, 5 MHz and external markers are each 1.0 V min. When markers coincide, their amplitudes add so that when all markers are presented the total amplitudes are 4.0, 3.0, 2.0 and 1.0 V, respectively.
Amplitude and Polarity Control	Markers are adjustable from 0 to 1.0 V with front panel control. Marker polarity selected by pushbutton control.
Width	Rectangular marker with 10 KHz center gap, typical.
Resolution	1 KHz (< 1 GHz); 1.0×10^{-6} (> 1 GHz).
Accuracy	1 part in 10^6 after warm-up, at 25° C.
Stability	
Temperature	5 parts in 10^7 per °C
Time	5 parts in 10^7 per hour
RF Input Power	-20 dbm to 0 dbm, 250 MHz to 12.4 GHz
Maximum Input Power	+20 dbm, burn-out.
Sweep Rate	20 MHz per millisec. max.; useable at faster rates but may reduce marker amplitude.
Temperature Range	0° to 55°C, operating; -55° to +85°C, storage
RF Input Impedance	Nominally 50 ohms
Connectors	Input RF, type N; all others, BNC
Power Input	115/230 Vac; 50 to 400 Hz; 25 W.
Physical	8.5" wide, 5.1" high, 15.0" deep. Weight, 15 lbs. Cabinet mount standard; rack mount available.

SECTION II
INITIAL INSTRUCTIONS

2-1. INITIAL INSPECTION

The Model 7300 Marker Generator should be carefully unpacked and inspected for damage upon receipt. Check the instrument for external damage such as broken controls or connectors and dents or scratches on the panel surfaces. If any mechanical damage is present, refer to paragraph 2-5 for damage claim instructions. If the instrument appears undamaged, perform the electrical inspection.

2-2. ELECTRICAL INSPECTION

Check the electrical performance of the Model 7300 as soon as possible after receipt by following the Performance Test procedure given in Table 5-2. The Performance Test procedure compares the instrument performance to the specifications given in Table 1-1 and is suitable for incoming quality control inspection. If the Model 7300 does not perform within the specifications, refer to paragraph 2-5 for damage claim instructions.

2-3. POWER REQUIREMENTS

The Model 7300 is normally connected at the factory for operation with 115 V ac (nominal) at 50 to 400 Hz. Power requirement is approximately 25 watts. However, the instrument can be converted for 230 V ac operation by the slide switch located on the rear panel. The exposed number on the slide switch indicates the proper line voltage to use. Position the slide switch so that the exposed number corresponds to the line voltage to be used.

2-4. CHASSIS GROUNDING

To protect operating personnel the Model 7300 is supplied with a three-conductor power cord and a three-prong plug which grounds the instrument when plugged into an appropriate receptacle. The offset prong is the ground connector. To preserve the grounding feature when operating the Marker Generator from a two-connector outlet, use a three prong-to-two prong adapter and connect the pigtail lead on the adapter to ground.

2-5. CLAIMS INFORMATION

If the Model 7300 is mechanically damaged or fails to meet electrical performance specifications upon receipt, a claim must be filed with the carrier. The carrier agent should inspect damage to the instrument and packing crate and a copy of his written report should be forwarded to the factory. You will then be advised of repair or replacement arrangements and disposition of the equipment. Please include model number and serial number when referring to your instrument in any correspondence.

SECTION III
OPERATING INSTRUCTIONS

3-1. INTRODUCTION

The Model 7300 Marker Generator produces frequency markers at precise 100-, 25- and 5- MHz intervals over the 5 MHz to 18 GHz range. Frequency markers at 500 KHz to 2.5 MHz intervals can also be produced, using an appropriate trigger signal applied to the front-panel EXT IN terminal. The frequency markers can be displayed independently or simultaneously, as determined by the illuminated front-panel pushbuttons. Additional pushbuttons are included for easy selection of marker polarity, external triggering operation and application of line voltage. Front-panel controls are provided to permit adjustment of marker output level and RF sensitivity.

When displayed simultaneously, the externally generated 5 MHz, 25 MHz and 100 MHz markers are generated at progressively greater amplitudes to provide a "ruler-type" display that calibrates the frequency axis of the display with 0.0001% accuracy. The Model 7300 output may be applied independently to the display device or may be added to another signal (e.g., frequency markers from the sweep oscillator) before display. The Model 7300 includes an adder circuit to permit the combining of the Marker Generator output with another signal via a front panel input terminal.

3-2. DESCRIPTION OF PANEL FEATURES

Front- and rear-panel controls and connectors are described in Figures 3-1 and 3-2. The numbered panel features in the figures are described in the correspondingly numbered paragraphs below the photograph.

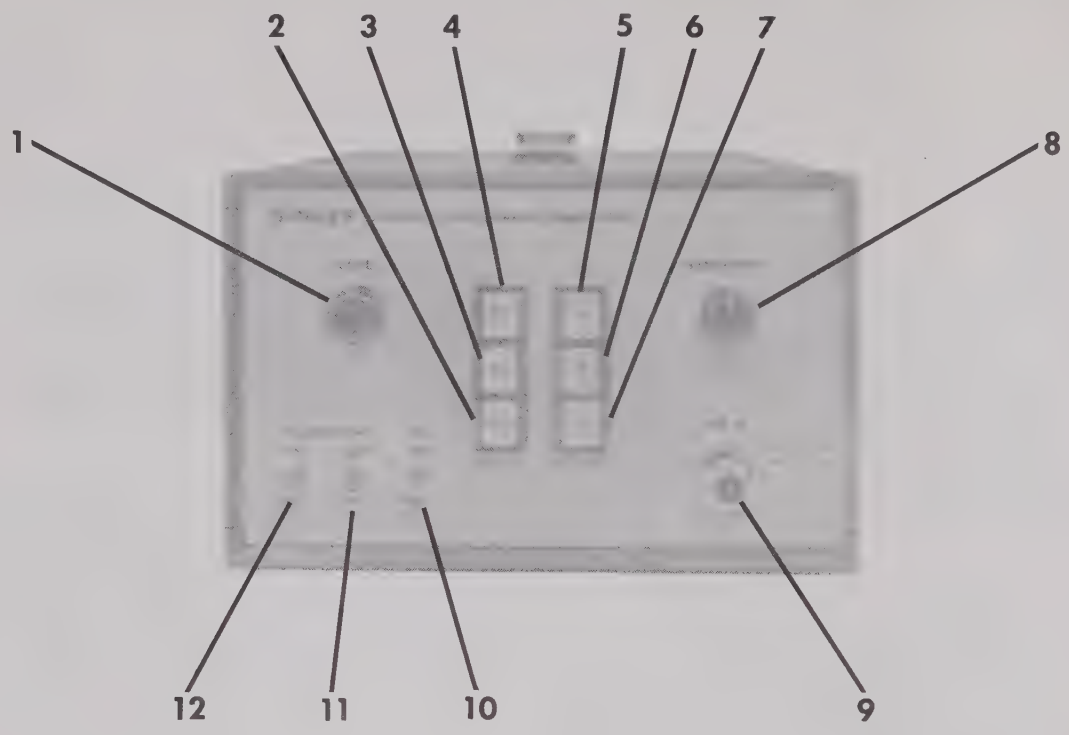
3-3. OPERATING CONSIDERATIONS

Input Signals

For optimum marker presentation, the RF input signal should be -20 to 0 dbm when operating in the 250 MHz to 12.4 GHz range. When operating in the 12.4 to 18 GHz range or below 250 MHz the RF input power should be > -20 dbm as determined by optimum marker display. The EXT IN terminal has a 600 ohm impedance and requires an input level between 0.1 and 1.0 V rms to assure optimum marker display.

Sweep Rate

The maximum oscillator sweep rate for optimum marker display should not exceed 20 MHz per millisecond. Faster oscillator sweep rates may be used but marker amplitude could be reduced.



1. LEVEL control. Adjusts amplitude of marker output from 0 (full ccw) to at least 1.0 V (full cw).

2. PWR pushbutton. Applies ac power to Model 7300 when depressed. Pushbutton lights in depressed position to indicate instrument is energized.

3. INV pushbutton. Inverts polarity of marker output when depressed. Pushbutton lights in depressed position to indicate marker polarity is inverted.

4. EXT pushbutton. Energizes internal circuits used for external triggering operation. Pushbutton lights in depressed position to indicate instrument is energized for external triggering operation.

5. 5 (MHz) pushbutton. Energizes internal circuits to produce marker outputs at 5 MHz intervals. Pushbutton lights in depressed position to indicate 5 MHz markers are available at ADDER OUT terminal.

6. 25 (MHz) pushbutton. Energizes internal circuits to produce marker outputs at 25 MHz intervals. Pushbutton lights in depressed position to indicate 25 MHz markers are available at ADDER OUT terminal.

7. 100 (MHz) pushbutton. Energizes internal circuits to produce marker outputs at 100 MHz intervals. Pushbutton lights in depressed position to indicate 100 MHz markers are available at ADDER OUT terminal.

8. SENSITIVITY control. Adjusts Model 7300 sensitivity to RF input to obtain optimum marker presentation. Sensitivity should be set at full clockwise under normal use. Sensitivity should be decreased when very strong or high spurious RF input produces spurious markers.

9. RF IN connector. Input terminal for RF signal with which marker output will be produced and displayed. Required input is -20 dBm to 0 dBm for 250 MHz to 12.4 GHz input; greater than -20 dBm RF input required to extend frequency range to 5 MHz to 18 GHz. Connector is type N.

CAUTION

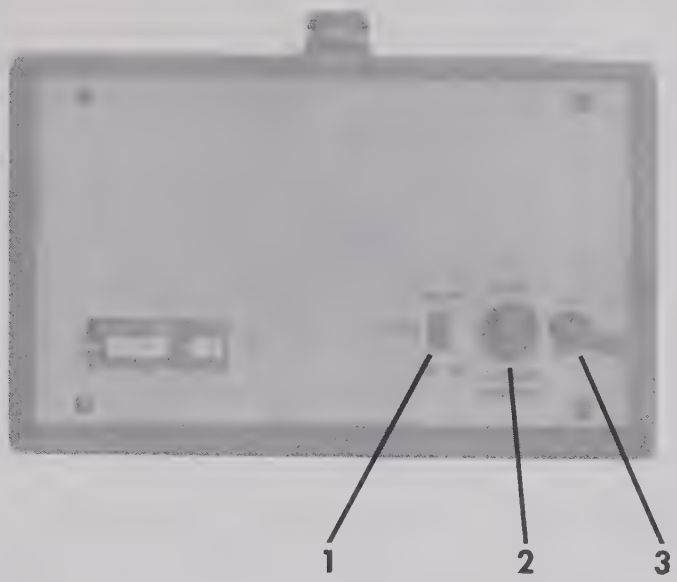
RF input signal should not exceed +20 dBm. Damage to the instrument will result.

10. EXT IN connector. Input terminal for external trigger signal during external triggering operation. Required input signal is 500 KHz to 2.5 MHz, 0.1 to 1.0 V rms. Input impedance is 600 ohms.

11. ADDER OUT connector. Output terminal for marker signals. Independent 100 MHz, 25 MHz, 5 MHz or externally triggered markers are 1.0 V min (LEVEL full cw). When displayed simultaneously, amplitudes are 4.0, 3.0, 2.0 and 1.0 V respectively.

12. ADDER IN connector. Input terminal for any additional signals to be added to RF and marker signal output (e.g. sweep oscillator markers or detected RF).

Figure 3-1. Front Panel Features, Model 7300



1. Line switch. Connects instrument ac input circuits to match available line voltage. When switch is in up position, instrument is connected for 230 V ac operation; down position is for 115 V ac operation.

2. FUSE. Provides overload protection for primary circuit. Replaceable fuse is 0.5 Amp, slow-blow.

3. Line cord. Connects instrument to primary-power source.

Figure 3-2. Rear Panel Features, Model 7300.

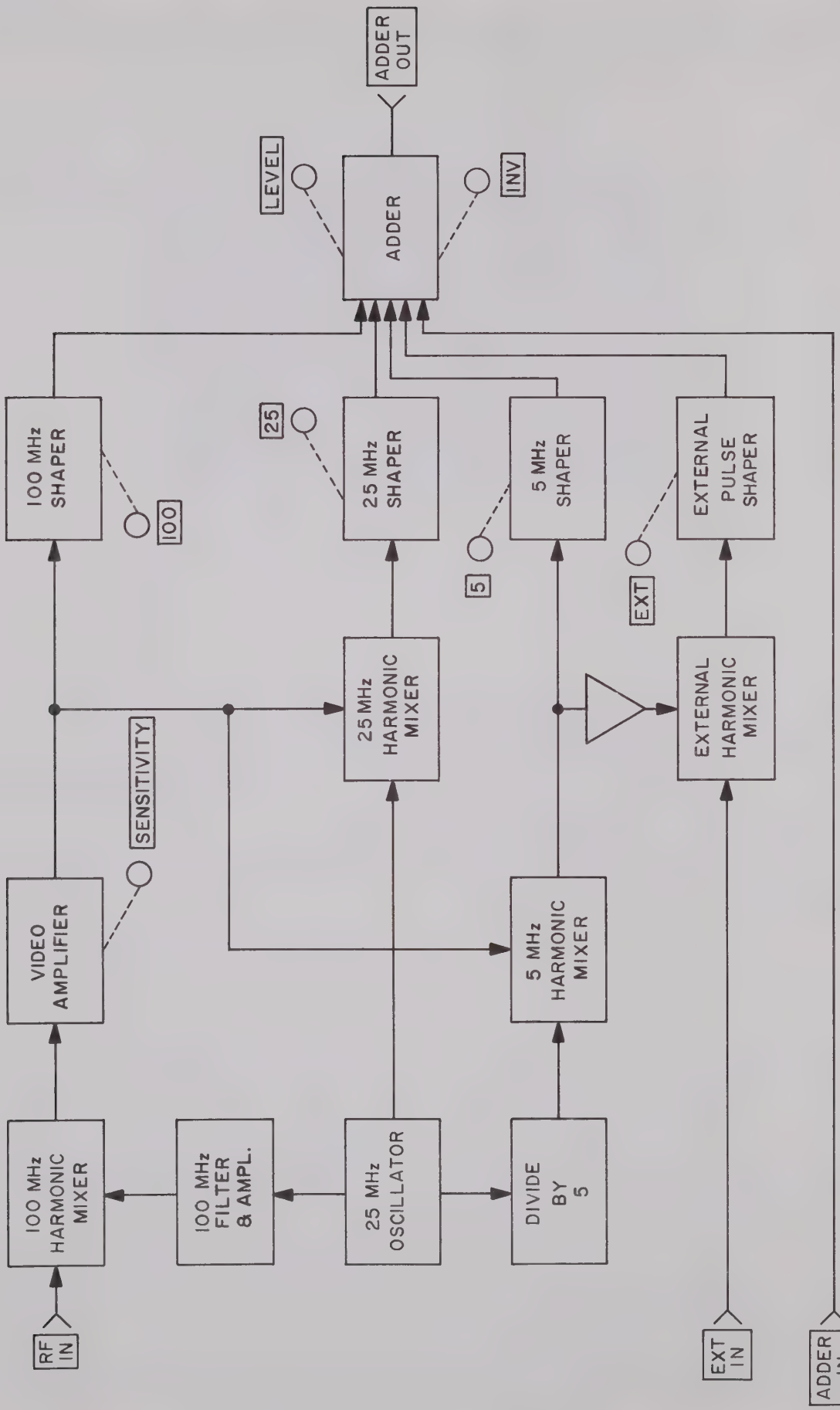


Figure 4-1. Simplified Block Diagram, Model 7300.

SECTION IV
THEORY OF OPERATION

4-1. GENERAL DESCRIPTION

The Model 7300 Marker Generator produces precise-interval markers by mixing the RF test signal with a high-stability oscillator signal generated within the Model 7300. A crystal-controlled 25 MHz oscillator provides the basic reference signal and determines the accuracy of the 100 MHz, 25 MHz and 5 MHz markers. A block diagram of the Model 7300 is shown in Figure 4-1.

To develop the 100 MHz markers, a distorted 25 MHz oscillator signal is fed through a 100 MHz tuned amplifier to a broad-band harmonic mixer. The 100 MHz signal drives a step-recovery diode, thus producing very sharp 100 MHz pulses with harmonics as high as 18 GHz. The rf test signal is mixed with the 100 MHz harmonic comb to produce a fundamental video output between dc and 50 MHz, plus other mixing products.

The mixer video output signal is fed to a 50 MHz low-pass filter and video amplifier that has a frequency response of 5 KHz to 50 MHz at the 3 db points. If the RF signal is between 250 MHz and 12.4 GHz and between -20 and 0 dbm, there will always be a video amplifier output.

The SENSITIVITY control adjusts the gain of the video amplifier to provide the proper input levels into the 100 MHz pulse shaper and the 25 MHz and 5 MHz harmonic mixers.

The 100 MHz marker pulses are obtained from a pulse shaper that covers the 5 KHz to 250 KHz frequency range. The pulse shaper consists of a low-pass filter, amplifier, Schmitt trigger and an integrator. If the input signal to the pulse shaper is between 5 KHz and 250 KHz; the low-pass filter and amplifier applies it to the Schmitt trigger. The integrator acts as a peak detector for the Schmitt trigger output. At the higher frequencies (near 250 KHz), the integrator output is a dc voltage of approximately +20 V. At low frequencies, the integrator, due to the long time constant, follows the Schmitt trigger output. As the frequency continues to drop, a point is reached at which the amplifier output is to small to trigger the Schmitt trigger and the integrator output will drop to zero.

The 25 MHz markers are produced by mixing the 25 MHz oscillator output with the output of the video amplifier in a harmonic mixer. Since the 25 MHz harmonic mixer is followed by a pulse shaper identical to the 100 MHz pulse shaper, an additional marker is produced at the output whenever the output of the 25 MHz mixer is between 5 KHz and 200 KHz.

Similarly, a third frequency marker is produced by mixing the video amplifier output with a 5 MHz signal. The 5 MHz is derived by applying the 25 MHz fundamental signal to a divide-by-five circuit. The pass-band of the filter and amplifier in the 5 MHz pulse shaper is 5 KHz to 150 KHz. Therefore, a marker is produced at the output whenever the output of the 5 MHz mixer is between 5 KHz and 150 KHz.

Externally triggered markers are produced at 500 KHz to 2.5 MHz intervals by mixing a 500 KHz to 2.5 MHz trigger signal (applied at the front panel) with the output of the 5 MHz mixer that is first amplified by a 5 KHz to 2.5 MHz amplifier. The pulse shaper for the external markers has a bandwidth of 5 KHz to 50 KHz. Therefore, a marker is produced whenever the external marker mixer output is between 5 KHz and 50 KHz.

The four marker signals from the pulse shapers are added together and fed, either directly, or through an inverter circuit, to the output terminal (ADDER OUT). The LEVEL control adjusts the marker amplitudes at the adder from 0 to at least 1.0 V. Since the 5-, 25- and 100- MHz signals are generated from one crystal source, and since the marker output from each of the pulse shapers are the same amplitude, an accentuated, "ruler-type" display with exactly coincident markers is produced whenever the markers are displayed simultaneously; the 100 MHz marker adds to the 25 MHz marker which adds to the 5 MHz marker. If externally triggered markers are added, the amplitudes of the internally generated markers are increased accordingly. Additional signals to be added to the marker display are also applied to the adder circuit.

4-2. 25 MHz OSCILLATOR & DIVIDER ASSEMBLY A5A1

The 25 MHz Oscillator and Divider Assembly, A5A1 provides the highly stable 25 MHz signal. The oscillator output is used directly to produce 25 MHz markers. The 100 MHz signal is derived from the fourth harmonic of the distorted oscillator output. The 5 MHz signal is obtained by applying the 25 MHz to a divide-by-five circuit.

The stable 25 MHz signal is produced by a modified crystal-controlled Colpitts oscillator, A5A2Q1 and associated components. The harmonic-rich 25 MHz output is coupled to Amplifier A5A1Q3 by the series resonant circuit consisting of A5A1L7 and A5A1C11. This series resonant circuit assures coupling of both a strong fundamental 25 MHz signal and a relatively strong 100 MHz fourth harmonic signal. The inductive collector load of A5A1Q3 further strengthens the 100 MHz signal. The 25 MHz oscillator output is also applied to Amplifier A5A1Q2 via the R-C network A5A1R4 and A5A1C10. This R-C network provides a low-impedance path for lower-frequency signals and thus assures a strong 25 MHz signal is sent to the divider circuit while the strength of the harmonic signals from the oscillator are greatly reduced.

The amplified output of A5A1Q3 is coupled to the 100 MHz Filter and Amplifier Assembly, A3, where the 100 MHz portion of the signal will be processed. The A5A1Q3 output is also coupled to Amplifier A5A1Q4 by the R-C network, A5A1C19 and A5A1R3. This network provides a lower impedance to the 25 MHz portion of the signal. Amplifier A5A1Q4 further amplifies the 25 MHz signal. The amplified output is applied to the harmonic mixer diode A5A1CR3 with the video output signal to provide the 25 MHz markers. The RF signal from the video amplifier is amplified by Amplifier A5A1Q7-Q8 before application to the 25 MHz mixer.

The 25 MHz mixer output is sent to the Pulse Amplifier Assembly, A5A2. The RF signal that is mixed with the 25 MHz signal is also sent to the Pulse Amplifier Assembly A5A2 for shaping of the 100 markers.

The 25 MHz oscillator signal that is amplified by Amplifier A5A1Q2 is applied to a divide-by-five circuit to derive the 5 MHz signal. Integrated circuits A5A1A1, A2 and A3 are connected in a short-counting configuration to provide one output pulse for every five input pulses. Zener diode A5A1CR1 regulates the Vcc voltage for the IC's. The 5 MHz output from A5A1A3 is amplified by Amplifier A5A1Q5 before being applied to the 5 MHz harmonic mixer, A5A1CR2. The amplified 5 MHz signal is mixed with the amplified RF signal from Amplifier A5A1Q8. The 5 MHz mixer output is sent to the Pulse Amplifier for shaping. Additionally, this 5 MHz signal is sent to the External Marker Assembly A6. Emitter Follower A5A1Q6 provides impedance matching between the 5 MHz mixer and External Marker Assembly.

4-3. 100 MHz FILTER & AMPLIFIER ASSEMBLY A3

The 100 MHz Filter and Amplifier Assembly A3 filters and amplifies the 100 MHz harmonic output from the 25 MHz oscillator. The 100 MHz signal produced at the output of this assembly produces a harmonic comb which is mixed with the RF test signal to produce the 100 MHz markers.

Amplifiers A3Q1, A3Q2, A3Q3, A3Q4 and A3Q5 are identical RF amplifier circuits with tuned-resonant circuits as the collector load. As the input signal progresses through each amplifier, the tuned-resonant circuits develop a cleaner 100 MHz signal. The 25 MHz fundamental and other harmonic signals are filtered out.

Cascade amplifiers A3Q6, A3Q7 and A3Q8 further amplify the 100 MHz signal. The L-C network of A4C41, 42 and A4L19 tune the 100 MHz class C output of A4Q8.

4-4. VIDEO AMPLIFIER ASSEMBLY A4

The Video Amplifier Assembly A4 filters and amplifies the output of the 100 MHz harmonic mixer. The output of the Video Amplifier is applied to the Pulse Amplifier Assembly A5A2 for shaping of the 100 MHz markers, and to the 25- and 5- MHz harmonic mixers to produce the 25- and 5- MHz markers. The front panel SENSITIVITY adjusts the gain of the Video Amplifier to assure proper signal strength is applied to the mixers and pulse shapers.

The Video Amplifier input is filtered by a low-pass filter consisting of A4C2 through A4C7 and A4L1, 2 and 3. The low-pass filter only passes signals below 50 MHz. The 0-to-50 MHz signal is first amplified by Amplifier A4Q1. The amplified output of A4Q1 is applied to the emitters of common-base Amplifiers A4Q2 and A4Q3.

Amplifier A4Q2 and A4Q3 are connected in a parallel configuration. The amount of signal coupled through A4Q2 is determined by the amount of shunting by A4Q3. The conduction of A4Q3 is determined by the AGC correction signal applied to its base.

The output from A4Q2 is amplified by integrated-circuit Amplifier A4A1. The frequency shaping network A4L4 and A4R35 ensures that the frequency response of the amplifier over the 5 KHz to 50 MHz range is constant. The amplified output from A4A1 is further amplified by Differential Amplifier A4Q4/A4Q5. The double-ended output provides one signal for further processing by the Pulse Amplifier Assembly A5A2 and a second signal used for closed-loop gain control of the Video Amplifier.

The output signal from A4Q4 is applied to one input of Differential Amplifier A4Q6A/B after being detected by A4CR2. A4CR3 provides temperature compensation for the detecting diode; A4CR4 develops the dc reference for A4CR3. The second dc input is provided by the front-panel SENSITIVITY control. The difference output of A4Q6 is amplified by DC Amplifier A4Q7 and sent to the control input of Differential Amplifier A4Q2/A4Q3.

This error signal changes the conduction, and therefore the shunting effect, of A4Q3, thus changing the detected dc signal back at the base of A4Q6 until there is no difference between the two inputs. If the input to the Video Amplifier attempts to vary, the error signal produced by A46QA/B will change the effective gain of the Video Amplifier to hold the output constant.

The SENSITIVITY control can also change the effective gain of the Video Amplifier since the reference input to A4Q6A/B is established by the SENSITIVITY potentiometer. Changing the dc reference will cause A4Q6A/B to develop an error signal output which will cause the A4Q2/Q3 combination to change the output until no error signal is produced.

4-5. PULSE AMPLIFIER ASSEMBLY A5A2

The Pulse Amplifier Assembly A5A2 seperately shapes the 5-, 25- and 100- MHz markers produced by the respective harmonic mixers. At the end of the shaping process the three signals are combined and applied to a phase-splitter and amplifiers to provide either-polarity output marker displays.

The marker signal from the 25 MHz mixer is applied to a low-pass filter consisting of A5A2C4,C5 and A5A2R1. The filter passband is below 200 KHz. As the video RF signal applied to the mixer sweeps past a 25 MHz multiple, the difference frequency output of the mixer will decrease to zero and increase again until the next 25 MHz multiple is reached as shown in Figure 4-2. The low-pass filter passes the difference frequency up to 200 KHz.

The marker signal is amplified by Amplifier A5A2Q1 (response rolls off below 5 KHz) and is coupled to a Schmitt trigger circuit by Emitter Follower A5A2Q2. The Schmitt trigger, consisting of A5A2Q3, Q4 and associated components, shapes the gradual responses of the filter into steep-sided rectangular pulses. These rectangular output pulses from the Schmitt trigger are applied to an integrator circuit consisting of A5A2C9, R16 and Q5.

Since the inherent long time constant of the integrator prevents its discharge at the higher frequencies of the marker pulse, the integrator acts as a peak detector. Thus, the marker amplitude at the outer edges is a positive dc voltage. At the lower marker frequencies, the longer time period allows the integrator to follow the marker signal. When the marker signal is below 5 KHz no signal is provided, producing a marker pulse as shown in Figure 4-3.

Transistor A5A2Q5 ensures that the integrator capacitor is completely discharged after each marker and before the next marker arrives. The output transistor of the Schmitt trigger, A5A2Q4, is off during the marker pulse and the +20 V collector potential charges the integrator capacitor through A5A2R15, R13. A5A2Q5 does not affect the integrator since the +20V potential holds it cutoff. After the marker is past however, A5A2Q4 is turned back on by its fixed bias, which causes A5A2Q5 to turn on. The conduction of A5A2Q5 provides a low-impedance discharge path for the integrator and ensures its discharge before the next marker arrives.

The integrated marker is coupled through Emitter Follower A5A2Q6 to the summing point to be added to the other, similarly processed 5- and 100- MHz markers. Processing of the 5- and 100- MHz

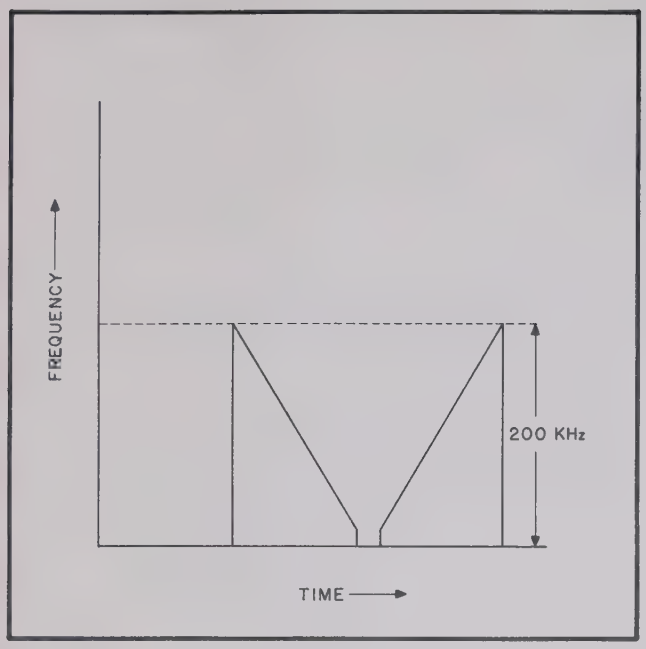


Figure 4-2. Frequency Response of Mixer Output as RF Signal Sweeps Past Harmonic Multiple.

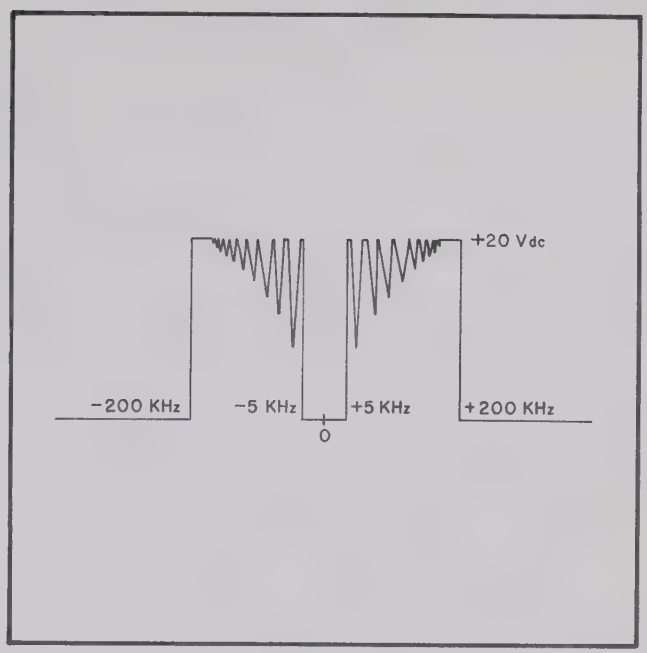


Figure 4-3. Representation of Resultant Marker Pulse Output Showing Effect of Integrator Circuit.

markers is identical to the 25 MHz process except that the filter bandwidth is 5 KHz to 250 KHz for the 100 MHz circuit and 5 KHz to 150 KHz for the 5 MHz circuit.

The summed marker signals are applied to Phase-splitter A5A2Q20. The equal-amplitude outputs are each coupled by Emitter Followers A5A2Q21 and A5A2Q22 to the front panel INV switch and then to the ADDER OUT terminal.

4-6. EXTERNAL MARKER ASSEMBLY A6

The External Marker Assembly A6 mixes a 500 KHz-to-2.5 MHz external triggering signal with a portion of the 5 MHz mixer output, producing markers that lie between the internally generated 5 MHz markers.

The signal from the 5 MHz mixer is filtered by a low-pass filter consisting of A6C11 through A6C17 and A6L4 through A6L6. The filter only passes mixer output frequencies below 2.5 MHz. This filtered output is amplified by Feedback Amplifiers A6Q1/A6Q2. The feedback network consists of A6C23 and A6R11, A6R12. The ratio of A6R12 to A6R11 determines the gain of the two-stage amplifier. The amplifier output is applied to the center tap of the transformer T1 secondary.

The external triggering signal is amplified and limited by integrated circuit Amplifier A6A1. The A6A1 output is differentiated by A6C9 and A6R7. The Amplifier A6Q3/A6Q4 output is applied to the primary winding of transformer A6T1.

The simultaneous application of the external triggering signal and the 5 MHz-mixer output results in a mixing of the two signals by diodes A6CR1 and A6CR2. The mixer output is filtered by the low-pass filter consisting of A6C25 and 26 and A6R18,19. Only frequencies below 50 KHz are passed by the filter. The filter output is amplified by Amplifiers A6Q5 and A6Q6. The A6Q6 output is coupled to Schmitt trigger A6Q8/Q9 by Emitter Follower A6Q7. The Schmitt trigger shapes the gradual responses of the filter into steep-sided rectangular pulses. These rectangular output pulses from the Schmitt trigger are applied to an integrator circuit consisting of A6R40, C34 and Q10.

Since the inherent long time constant of the integrator prevents its discharge at the higher frequencies of the marker pulse, the integrator acts as a peak detector. Thus the marker amplitude at the outer edges is a positive dc voltage. At the lower marker pulse frequencies, the longer time period allows the integrator to follow the marker signal. When the marker signal is below 5 KHz, no signal is provided by the band-pass filter.

Transistor A6Q10 ensures that the integrator capacitor is completely discharged after each marker and before the next marker arrives. The output transistor of the Schmitt trigger, A6Q9 is off during the marker pulse and the +20 V collector potential charges the integrator capacitor through A6R40 and A6R37. A6Q10 does not affect the integrator since the +20 V potential holds it cutoff. After the marker is past however, A6Q9 is turned back on by its fixed bias, which causes A6Q10 to turn on. The conduction of A6Q10 provides a low-impedance discharge path for the integrator and ensures its discharge before the next marker arrives.

The integrated marker output is coupled through Emitter Follower A6Q11 to the summing point in the A5A2 Assembly to be added to the other, similarly processed internal frequency markers.

TABLE 5-1. REQUIRED TEST EQUIPMENT

INSTRUMENT	CRITICAL SPECIFICATIONS	RECOMMENDED MODEL
Sweep Oscillator	Frequency Range: 250 MHz - 12.4 GHz Output Power: 0 dBm	Singer Model 650/651A through 655
Signal Generator	Frequency Range: 500 KHz - 2.5 MHz Output: 1.0 to 0.1 V rms	HP 651D
Oscilloscope	Channels: 2 Vert. sens.: .1V/cm	Tektronics Model 553 w/1A1 plug-in
Frequency Counter	Frequency Range: $\geq$ 100 MHz Accuracy: 1×10^{-7}	Systron-Donner Model 1038
Digital Voltmeter	Range: 0 to ± 20V Accuracy: 0.05%	Fairchild Model 7100
Spectrum Analyzer	Frequency Range: 50 MHz - 2 GHz Absolute Power Calibration	HP 8552/8555
Directional Coupler	Directivity: 10 dB	
Detector		

SECTION V
MAINTENANCE

5-1. INTRODUCTION

The information provided in Section V contains performance verification procedures in accordance with published specifications, calibration adjustment procedures for periodic calibration, and troubleshooting information to isolate malfunctioning assemblies.

5-2. INITIAL CONTROL SETTINGS

Unless otherwise specified, set the front panel controls of the Model 7300 for the performance tests, calibration adjustment, and troubleshooting procedures as follows:

PWR . . . . . Depressed
INV . . . . . Released
EXT . . . . . Released
5 (MHz) . . . . . Released
25 (MHz) . . . . . Released
100 (MHz) . . . . . Released
LEVEL . . . . . Fully clockwise
SENSITIVITY . . . . . Fully clockwise

5-3. REQUIRED TEST EQUIPMENT

The test equipment required for performance testing, calibration adjustment and troubleshooting is given in Table 5-1. Test equipment other than those specified can be used provided their performance equals or exceeds the critical specifications given.

5-4. PERFORMANCE TESTS

The performance tests given in Table 5-2 are provided to verify instrument operation in accordance with published specifications either as an incoming inspection or for periodic calibration tests. Access to the instrument interior is not required. If the Model 7300 fails to meet any of the tested specifications and a malfunction is not suspected, either return the instrument to the factory or recalibrate the instrument according to the procedures provided in Table 5-3. If a malfunction is suspected, refer to the troubleshooting procedures given in Table 5-4.

5-5. CALIBRATION ADJUSTMENT PROCEDURE

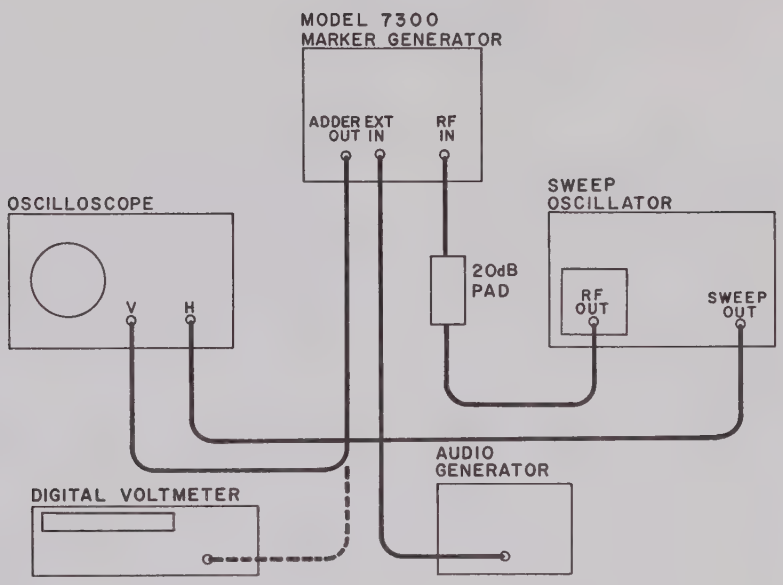
The calibration adjustments given in Table 5-3 are provided to permit instrument adjustment, either for periodic calibration or recalibration after replacing defective components. If the Model 7300 cannot be adjusted to operate within specifications, either return the instrument to the factory or isolate and repair the defective assembly using the troubleshooting procedures given in Table 5-4. No adjustments should be made unless test measurement is out of tolerance. Location of adjustments are shown in Figure 5-1.

5-6. TROUBLESHOOTING PROCEDURES

The flow diagram in Table 5-4 is designed to quickly isolate the defective circuit or assembly when a malfunction occurs. Correct operating procedures, as explained in Section III, should be observed.

TABLE 5-2. PERFORMANCE TEST PROCEDURE

a. Connect equipment as shown below:



b. Depress the 5 pushbutton. The pushbutton should light up to indicate that appropriate internal circuits are energized.

c. Adjust the sweep oscillator frequency over the entire frequency range from 250 MHz to 12.4 GHz and observe the oscilloscope display.

d. The Model 7300 should produce 1.0 V (minimum) markers at 5 MHz intervals from 250 MHz to 12.4 GHz.

e. Repeat step c with 25 pushbutton depressed and then with 100 pushbutton depressed.

f. The Model 7300 should produce 25 MHz markers and 100 MHz markers respectively, each 1.0 V (minimum) in amplitude.

g. Connect signal generator to EXT IN and adjust controls for 0.1 to 1.0 V ouput from 500 KHz to 2.5 MHz.

h. Depress the EXT pushbutton and observe that pushbutton lights up to indicate appropriate internal circuits are energized.

i. Vary the signal generator frequency over the 500 KHz to 2.5 MHz range and observe the oscilloscope display.

j. The Model 7300 provides externally triggered markers at submultiples of 5 MHz from 500 KHz to 2.5 MHz that are 1.0 V in amplitude.

k. Depress the 5, 25 and 100 pushbutton and observe that the Model 7300 produces externally triggered, 5 MHz, 25 MHz and 100 MHz markers simultaneously. The marker amplitudes are 1.0, 2.0, 3.0 and 4.0 V, respectively. Release the 100, 25 and EXT pushbuttons.

l. Rotate the LEVEL control from full clockwise to full counterclockwise and observe the display to confirm that the marker amplitude can be adjusted from 1.0 to 0 V. Return to full clockwise.

m. Depress the INV pushbutton and observe that the marker display polarity is reversed. Release INV pushbutton.

n. Connect counter to RF IN via 100 MHz LP filter. Counter should read 100 MHz ± 100 Hz at 25° C ±2° C (after 2 hour warm-up). (50 Hz/°C dev. at other than 25° C).

TABLE 5-3. CALIBRATION ADJUSTMENT PROCEDURES

Remove top and both side panels and allow 2 hours warm-up. Do not make any adjustments unless test measurement is out of tolerance.

1. POWER SUPPLY

a. Connect DVM "hot" lead to test point A2TP1 and ground lead to test point A2TP3.

b. Depress all front-panel pushbuttons of Model 7300 and observe DVM reading.

c. Adjust A2R11 for -20.00 ± 0.1 V dc, if required.

2. PULSE SHAPERS

a. Set sweep oscillator controls as follows:

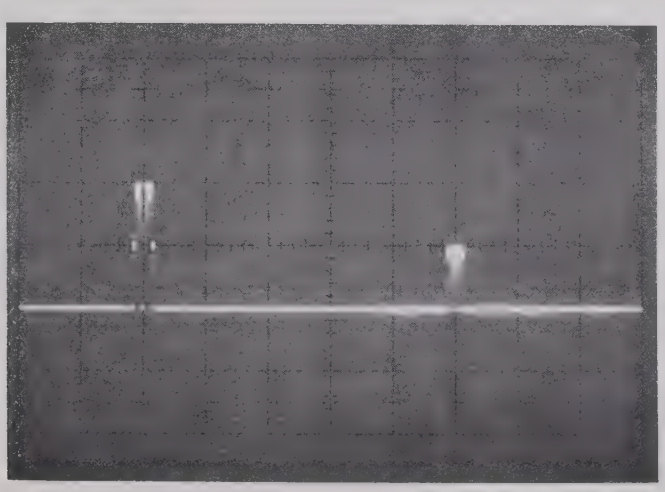
Mode . . . . . Fo ± ΔF
Fo . . . . . 12.0 GHz
ΔF . . . . . fully clockwise
Level . . . . . + 5 dBm
Sweep . . . . . 50 msec

b. Set oscilloscope controls as follows:

Vertical. . . . . 2 V/cm
Horizontal . . . . . EXT, X1

c. Release INV and 25 pushbuttons.

d. Adjust Fo and ΔF controls to obtain oscilloscope display of double marker and single marker five cm apart as shown below:



e. Adjust external trigger signal generator about 500 KHz to eliminate "overlap" effect on oscilloscope display.

f. Release EXT pushbutton, set oscilloscope sweep to X0.1, and adjust Fo control to center double marker on display.

g. Release 5 front-panel pushbutton and observe oscilloscope display.

h. If required, adjust A5A2R47 to obtain marker width of 5 cm ± 0.5 cm as measured at the 50% amplitude points.

i. Release 100 pushbutton, depress 25 pushbutton and observe oscilloscope display.

j. If required, adjust A5A2R5 to obtain marker width of 4 cm ± 0.5 cm as measured at the 50% amplitude points.

k. Release 25 pushbutton, depress 5 pushbutton, and observe oscilloscope display.

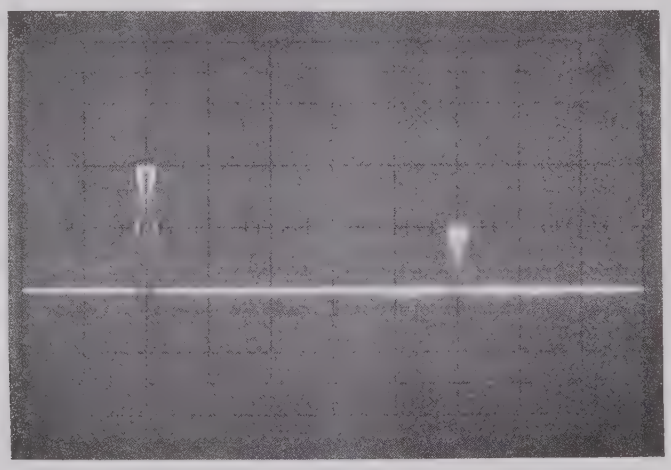
l. If required, adjust A5A2R28 to obtain marker width of 3 cm ±0.5 cm as measured at the 50% amplitude points.

m. Depress EXT pushbutton and adjust Fo control to center the single marker that is adjacent to the double marker.

n. If required, adjust A6R28 to obtain marker width of 1 cm ± 0.25 cm as measured at the 50% amplitude points.

o. Release EXT pushbutton, depress 25 and 100 pushbuttons, and set oscilloscope external sweep to X1.

p. Adjust Fo control to position the tenth 5 marker (coincident with second 25 marker) to the right of the triple marker as shown below:



q. Set oscilloscope external sweep to X0.1 and adjust Fo control to center the double marker on the display.

r. If required, carefully adjust A3C19, C14, C9, C2 and C23 sequentially to obtain maximum marker width. Repeat the sequence until no further adjustment is required.

s. Adjust A3C41, A3C42 and A4C54 (in Video Ampl. Assy.) to obtain marker widths of 3 cm ± 0.5 cm (for 5 marker) and 4 cm ± 0.5 cm (for 25 marker).

t. Remove 20dB pad from RF IN connection and replace oscilloscope with DVM. Release 100, 25 and 5 pushbuttons, depress INV pushbutton, and set LEVEL control to full counterclockwise.

u. Adjust A2R5 (on Power Supply Assy.) for 0 V dc DVM reading.

v. Set LEVEL control to full clockwise and observe DVM reading.

w. If required, adjust A5A2R64 for 0 V dc.

x. Disconnect all test equipment.

3. 25 MHz OSCILLATOR

a. Disconnect internal cables at A5A1J5 and A6J1. Connect A6J1 cable to A5A1J5.

CAUTION

Avoid contact between loose cables
and power supply assembly.

b. Attach top and side panels and depress all front-panel pushbuttons.

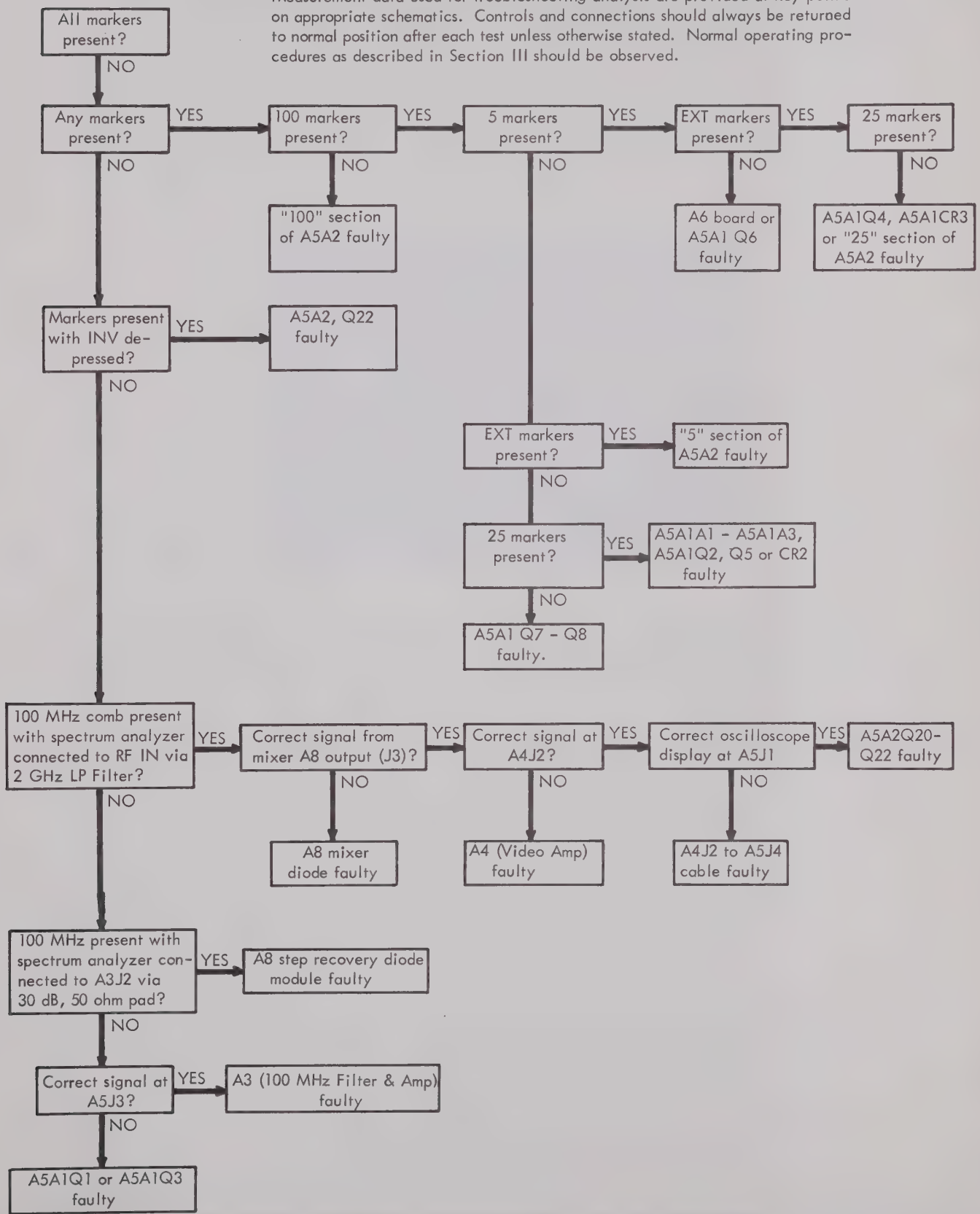
c. Connect frequency counter to EXT IN terminal with Model 7300 in a constant $25^{\circ} \pm 2^{\circ}$ C environment and allow 2 hours for warm-up time.

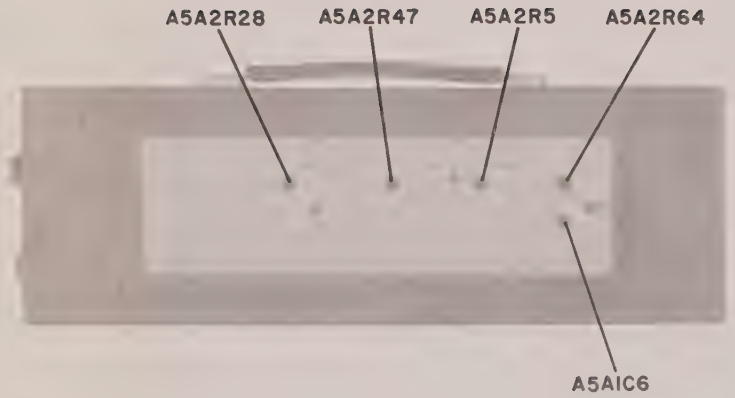
d. If required, remove right side panel and adjust A5A1C6 for 5 MHz ± 2 Hz counter reading.

e. Restore original connections of internal cables and reinstall top and side panel.

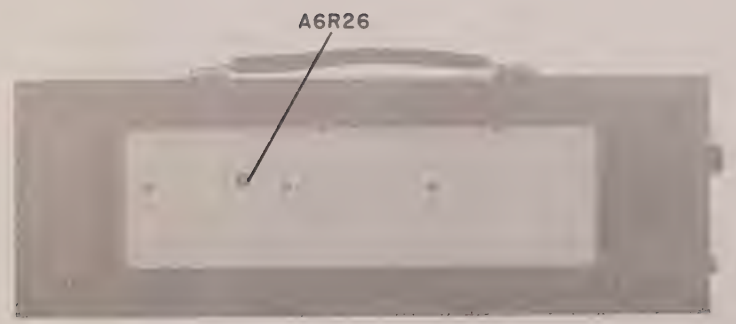
TABLE 5-4. TROUBLESHOOTING PROCEDURE

Measurement data used for troubleshooting analysis are provided at key points on appropriate schematics. Controls and connections should always be returned to normal position after each test unless otherwise stated. Normal operating procedures as described in Section III should be observed.

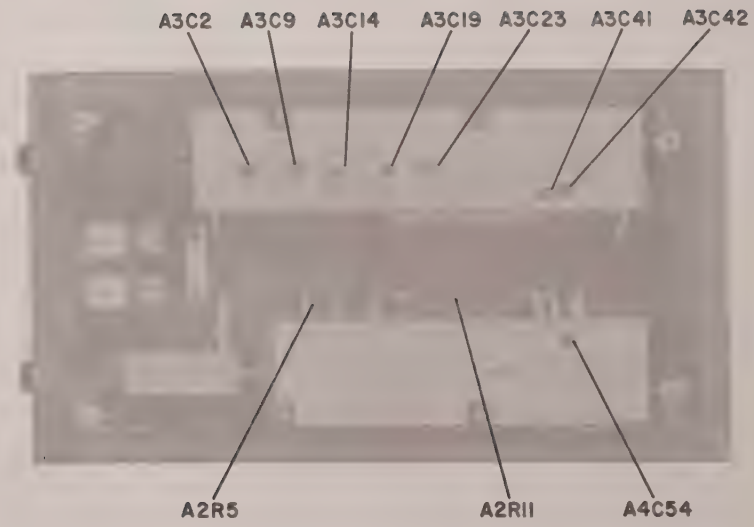




Right Side View



Left Side View



Top View

Figure 5-1. Top and Side Interior Views Showing Location of Adjustments.

SECTION VI
PARTS LIST

6-1. GENERAL INFORMATION

This section contains information necessary for ordering replacement parts. Table 6-1 lists parts in alpha-numerical order of their reference designators. The listings include the Singer part number, description of the part, manufacturers part number and Federal Supply Code number of the part manufacturer. Table 6-2 contains the FSC code number and appropriate manufacturer names used in Table 6-1.

6-2. ORDERING INFORMATION

To obtain replacement parts, address order for replacement parts to Singer Co., Palo Alto Operation or nearest Service Center listed inside the front cover of this manual.

To order a part not listed, include the following information:
a. Instrument model number.
b. Instrument serial number.
c. Description of the part.
d. Function and location of the part.

MODEL 7300 ASSEMBLIES

CIRCUIT REFERENCE	SINGER PART NO.	DESCRIPTION
A1	952047	Mother Board P.C. Assembly
A2	952301	Power Supply Assembly
A3	952083	100 MHz Filter and Amplifier Assembly
A4	952085	Video Amplifier Assembly
A5	952086	25 MHz Oscillator and Pulse Amplifier Assembly
A5A1	952054	25 MHz Oscillator and Divider Assembly
A5A2	952055	Pulse Amplifier Assembly
A6	952084	External Marker Assembly
A7		Not assigned
A8	951815	Mixer Assembly
A9	952069	Switch Assy., S3
A10	952068	Switch Assy., S2
		Electrical Chassis Parts
		Mechanical Chassis Parts

A1 MOTHER BOARD P.C. ASSEMBLY

CIRCUIT REFERENCE	ALFRED PART NO.	DESCRIPTION	TRUE MFR. FSC NO.	TRUE MFR. PART NO.
		FUSES		
A1F1	121-15	Fuse, 0.6 A, 250 V, Type 3 AG, Slo-blo.	75915	373.600
		CONNECTORS		
A1J1	133-115	Connector, P.C., 22 - PIN	74868	143-022-03
A1J2 thru A1J5	133-114	Connector, P.C., 10 - PIN	74868	143-022-03
		SWITCHES		
A1S1	102-156	Switch, Slide, DPDT	82389	46206LF
		HOLDERS		
A1XF1	122-1	Fuseholder	75915	342004

A2 POWER SUPPLY ASSEMBLY

CIRCUIT REFERENCE	ALFRED PART NO	DESCRIPTION	TRUE MFR. FSC NO.	TRUE MFR. PART NO.
		INTEGRATED CIRCUITS		
A2A1 and A2A2	84-6	Integrated circuit, voltage regulator.	07263	U5R7723393
		CAPACITORS		
A2C1	13-81	Cap., fixed, elect., 2300 µf, +100 - 10%, 50 WVDC	56289	3902386050 JT4
A2C2	12-26	Cap., fixed, ceramic, 500 pf, ±10%, 500V	12598	DD501
A2C3	12-34	Cap., fixed, ceramic, 0.1 µf, +80 - 20%, 100V	91418	BT 010
A2C4	13-49	Cap., fixed, elect., 50 µf, +100 - 10%, 25 WVDC	56289	TE 1209
A2C5	13-81	Cap., fixed, elect., 2300 µf, +100 - 10%, 50 WVDC	56289	39D238G050JT4
A2C6	12-26	Cap., fixed, ceramic, 500 pf, ±10%, 500V	12598	DD501
A2C7	12-34	Cap., fixed,ceramic, 0.1 µf, +80 - 20%, 100V	91418	BT 010
A2C8	13-49	Cap., fixed, elect., 50 µf, +100 - 10%, 25 WVDC	56289	TE 1209
		DIODES		
A2CR1 and A2CR2	81-178	Rectifier, diode bridge, 50 piv., 1.0 A	04713	MDA-920A-2
		TRANSISTORS		
A2Q1 and A2Q2	81-270	Transistor, pwr;, silicon, 10 A, 60V, 90 W	04713	MFE3055
		RESISTORS		
A2R1	34-8.2K	Res., fixed, comp., 8.2K, ±5%, 1/4 W	01121	CS 8225
A2R2	44-0.82	Res., fixed, WW, 0.82 ohm, ±5%, 1 W	75042	BWH
A2R3	34-1K	Res., fixed, comp., 1K, ±5%, 1/4 W	01121	CS 1025
A2R4	59-19.6K	Res., fixed MF, 19.6K, ±1%, 1/4 W	19701	MF-5C-E-19.6F
A2R5	71-162	Res., variable, WW, 1K, ±10%, 1/2 W	75042	500-1K
A2R6	59-10.5K	Res., fixed, MF, 10.5K, ±1%, 1/4 W	19701	MF-5C-E-10.5F
A2R7	34-8.2K	Res., fixed, comp., 8.2K, ±5%, 1/4 W	01121	CS 8225
A2R8	44-0.82	Res., fixed, WW, 0.82 ohm, ±5%, 1 W	75042	BWH
A2R9	34-1K	Res., fixed, comp., 1K, ±5% 1/4 W	01121	CS 1025
A2R10	59-19.6K	Res., fixed, MF, 19.6K, ±1%, 1/4 W	19701	MF-5C-E-19.6F
A2R11	71-162	Res., variable, WW, 1K, ±10%, 1/2 W	75042	500-1K
A2R12	59-10.5K	Res., fixed, MF, 10.5K, ±1%, 1/4 W	19701	MF-5C-E-10.5F
		TEST POINTS		
A2TP1 thru A2TP3	133-113	Test point	74970	105-853

A3 100 MHz FILTER AND AMPLIFIER ASSEMBLY

CIRCUIT REFERENCE	ALFRED PART NO.	DESCRIPTION	TRUE MFR. FSC NO.	TRUE MFR. PART NO.
		CAPACITORS		
A3C1	12-22	Cap., fixed, disc ceramic, 100 pf, ±10%, 1KV	72982	E100KX5F
A3C2	23-8	Cap., variable, 9-35 pf	72982	538-011-D-9-35
A3C3	11-29	Cap., fixed dipped mica, 20 pf, ±2%, 500V	00853	D153E200D
A3C4	12-54	Cap., fixed, ceramic, F.T., 1000 pf 100V	00656	EF 5
A3C5	13-82	Cap., fixed, Alum, Electrolytic, Tubular, 35 uf, ±80 - 20%, 25 WVDC	56289	TE 1208
A3C6	12-54	Cap., fixed, ceramic, F.T., 1000 pf, 100V	00656	EF5
A3C7	12-22	Cap., fixed, disc ceramic, 100 pf, ±10%, 1KV	72982	E100KX5F
A3C8	12-54	Cap., fixed, ceramic, F.T., 1000 pf 100V	00656	EF5
A3C9	23-8	Cap., variable, 9-35 pf	72982	538-011-D-9-35
A3C10	11-29	Cap., fixed, dipped mica, 20 pf, ±2%, 500V	00853	D153E200D
A3C11	12-54	Cap., fixed, ceramic, F.T., 1000 pf, 100V	00656	EF5
A3C12	12-22	Cap., fixed, disc ceramic, 100 pf, ±10%, 1KV	72982	E100KX5F
A3C13	12-54	Cap., fixed, ceramic, F.T., 1000 pf, 100V	00656	EF5
A3C14	23-8	Cap., variable, 9-35 pf	72982	538-011-D-9-35
A3C15	11-29	Cap., fixed, dipped mica, 20 pf, ±2%, 500V	00853	D153200D
A3C16	12-54	Cap., fixed, ceramic, F.T., 1000 pf, 100V	00656	EF5
A3C17	12-22	Cap., fixed, disc ceramic, 100 pf, ±10%, 1KV	72982	E100KX5F
A3C18	12-54	Cap., fixed, ceramic, F.T., 1000 pf, 100V	00656	EF5
A3C19	23-8	Cap., variable, 9-35 pf	72982	538-011-D-9-35
A3C20	11-29	Cap., fixed, dipped mica, 20 pf, ±2%, 500V	00853	D153E200D
A3C21	12-54	Cap., fixed, ceramic, F.T., 1000 pf, 100V	00656	EF5
A3C22	12-22	Cap., fixed, disc ceramic, 100 pf, ±10%, 1KV	75982	E100KX5F
A3C23	23-8	Cap., variable, 9-35 pf	72982	538-011-D-9-35
A3C24	11-29	Cap., fixed, dipped mica, 20 pf, ±2%, 500V	00853	D153E200D
A3C25	12-54	Cap., fixed, ceramic, F.T., 1000 pf, 100V	00656	EF5
A3C26	12-22	Cap., fixed, disc ceramic, 100 pf, ±10%, 1KV	72982	E100KX5F
A3C27		Not used.		
A3C28 and A3C29	12-54	Cap., fixed, ceramic, F.T., 1000 pf, 100V	00656	EF5
A3C30	12-22	Cap., fixed, disc ceramic, 100 pf, ±10%, 1KV	72982	E100KX5F
A3C31 and A3C32	12-54	Cap., fixed, ceramic F.T., 1000 pf 100V	00656	EF5
A3C33	12-26	Cap., fixed, disc ceramic, 500 pf, ±10%, 1KV		
A3C34	12-44	Cap., fixed, disc ceramic, 680 µf, ±10%, 1000V	71590	DD-68
A3C35 thru A3C37	12-56	Cap., fixed, disc ceramic, .01 µf, GMV, 25V	56289	HY 520
A3C38		Not used.		
A3C39 and A3C40	12-56	Cap., fixed, disc ceramic, .01 µf, GMV, 25V	56289	HY 520
A3C41	23-9	Cap., variable, 2-20 pf	73899	DU J300
A3C42	23-8	Cap., variable, 9-35 pf	72982	538-011-D-9-35
A3C43		Not used.		
A3C44	12-56	Cap., fixed, disc ceramic, .01 µf, GMC, 25V	56289	HY 520
A3C45	12-27	Cap., fixed, disc ceramic, 270 pf, ±10%, 1KV	71590	DD 271

A3 100 MHz FILTER AND AMPLIFIER ASSEMBLY

CIRCUIT REFERENCE	ALFRED PART NO.	DESCRIPTION	TRUE MFR. FSC NO.	TRUE MFR. PART NO.
		CONNECTORS		
A3J1 and A3J2	131-46	Connector, RF, Right Angle, Miniature, 50 ohms, PC Mount	24931	P5020
		INDICATORS		
A3L1	92-6	Coil, RF, Molded, 2.2 µh, ±10%	71895	1025-28
A3L2		Not used		
A3L3	92-6	Coil, RF, Molded, 2.2 µh, ±10%	71895	1025-28
A3L4		Not used		
A3L5	92-6	Coil, RF, Molded, 2.2 µh, ±10%	71895	1025-28
A3L6		Not used		
A3L7	92-6	Coil, RF, Molded, 2.2 µh, ±10%	71895	1025-28
A3L8 and A3L9		Not used		
A3L10	191-53	Ferrite Bead with 3 turns AWG 26	02114	5659065/3B
A3L11 thru A3L13	92-6	Coil, RF, Molded, 2.2 µh, ±10%	71895	1025-28
A3L14	191-53	Ferrite Bead with 3 turns AWG 26	02114	5659065138
A3L15	92-6	Coil, RF, Molded, 2.2 µh, ±10%	71895	1025-28
A3L16	92-18	Coil, RF, 1.0 µh, ±10%	71895	1025-20
A3L17 and A3L18	92-6	Coil, RF, Molded, 2.2 µh, ±10%	71895	1025-28
A3L19	92-48	Coil, RF, 0.15 µh, ±10%	71895	1025-00
A3L20	92-6	Coil, RF, Molded, 2.2 µh, ±10%	71895	1025-28
		TRANSISTORS		
A3Q1 thru A3Q5	81-131	Transistor, 2N3563	07263	2N3563
A3Q6	81-272	Transistor, 2N5179	86684	2N5179
A3Q7 and A3Q8	81-271	Transistor, 2N5109	86684	2N5109
		RESISTORS		
A3R1 and A3R2	34-8.2K	Res., fixed, comp., 8.2K, ±5%, 1/4 W	01121	CS 8225
A3R3	34-680	Res., fixed, comp., 680 ohms, ±5%, 1/4	01121	CS 6815
A3R4	34-1.8K	Res., fixed, comp., 1.8K, ±5% 1/4 W	01121	CS 1825
A3R5 and A3R6	34-8.2K	Res., fixed, comp., 8.2K, ±5% 1/4 W	01121	CS 8225
A3R7	34-680	Res., fixed, comp., 680 ohms, ±5%, 1/4 W	01121	CS 6815
A3R8	34-1.8K	Res., fixed, comp., 1.8K, ±5%, 1/4 W	01121	CS 1825
A3R9 and A3R10	34-8.2K	Res., fixed, comp., 8.2K, ±5%, 1/4 W	01121	CS 8225
A3R11	34-680	Res., fixed, comp., 680 ohms, ±5% 1/4 W	01121	CS 6815
A3R12	34-1.8K	Res., fixed, comp., 1.8K, ±5%, 1/4 W	01121	CS 1825
A3R13 and A3R14	34-8.2K	Res., fixed, comp., 8.2K, ±5%, 1/4 W	01121	CS 8225
A3R15	34-680	Res., fixed, comp., 680 ohms, ±5% 1/4 W	01121	CS 6815
A3R16	34-1K	Res., fixed, comp., 1 K, ±5%, 1/4 W	01121	CS 1025
A3R17 and A3R18	34-8.2K	Res, fixed, comp., 8.2K, ±5%, 1/4 W	01121	CS 8225
A3R19	34-680	Res., fixed, comp., 680 ohms, ±5%, 1/4 W	01121	CS 6815
A3R20	34-1K	Res., fixed, comp., 1K, ±5%, 1/4 W	01121	CS 1025
A3R21	34-1.8K	Res., fixed, comp., 1.8K, ±5%, 1/4 W	01121	CS 1825
A3R22	34-220	Res., fixed, comp., 220 ohms, ±5%, 1/4 W	01121	CS 2215
A3R23	34-1.2K	Res., fixed, comp., 1.2K, ±5%, 1/4 W	01121	CS 1225
A3R24	34-390	Res., fixed, comp., 390 ohms, ±5%, 1/4 W	01121	CS 3915
A3R25	34-560	Res., fixed, comp., 560 ohms, ±5%, 1/4 W	01121	CS 5615

A3 100 MHz FILTER AND AMPLIFIER ASSEMBLY

CIRCUIT REFERENCE	ALFRED PART NO.	DESCRIPTION	TRUE MFR. FSC NO.	TRUE MFR. PART NO.
		RESISTORS (Con't)		
A3R26	42-390	Res., fixed, comp., 390 ohms, ±10%, 1 W	01121	GB 3911
A3R27	42-270	Res., fixed, comp., 270 ohms, ±10%, 1/4 W	01121	GB 2711
A3R28		(AWG 20 bus wire, item 37. Resistor value selected in test, if required.)		
A3R29 and A3R30	34-270	Res., fixed, comp., 270 ohms, ±5%, 1/4 W	01121	CS 2715

A4 VIDEO AMPLIFIER ASSEMBLY

CIRCUIT REFERENCE	ALFRED PART NO.	DESCRIPTION	TRUE MFR. FSC NO.	TRUE MFR. PART NO.
		INTEGRATED CIRCUITS		
A4A1	84-7	Integrated Circuit, Operational Amplifier	07263	U5F7733393
		CAPACITORS		
A4C1	11-40	Cap., fixed, dipped mica, 4 pf ±0.5 pf, 500V	72136	DM5-CC-040D
A4C2	11-25	Cap., fixed, dipped mica, 47 pf, ±5%, 500V	00853	D15-5-E-470-J
A4C3	11-42	Cap., fixed, dipped mica, 27 pf, ±5%, 500V	72136	DM15-270J
A4C4	11-34	Cap., fixed, dipped mica, 100 pf, ±2%, 500V	00853	D153E101G
A4C5	11-41	Cap., fixed, dipped mica, 18 pf, ±5%, 500V	72136	DM15-180J
A4C6	11-32	Cap., fixed, dipped mica, 91 pf, ±2%, 500V	00853	D153E910G
A4C7	11-35	Cap., fixed, dipped mica, 39 pf, ±2%, 500V	00853	D153E390G
A4C8	13-70	Cap., fixed, Tantalum, Electrolytic, 1.0 µf, ±10%, 35 WVDC	22229	K1C35K
A4C9	12-56	Cap., fixed, ceramic disc, .01 µf, GMV, 25V	56289	HY 520
A4C10	13-68	Cap., fixed, Tantalum, Electrolytic, 3.3 µf, ±10%, 15 WVDC	22229	K3R3C15K
A4C11 thru A4C13	12-56	Cap., fixed, ceramic disc, .01 µf, GMV, 25V	56289	HY 520
A4C14	12-73	Cap., fixed, ceramic, .047 µf, ±20%, 50V	72982	8131-050-W5R-473M
A4C15	12-72	Cap., fixed, ceramic, 0.1 µf, ±20%, 50V		
A4C16	12-56	Cap., fixed, ceramic, disc, .01µf, GMV, 25V	56289	HY 520
A4C17	13-70	Cap., fixed, Tantalum, Electrolytic, 1.0 µf, ±10%, 35 WVDC	22229	K1C35K
A4C18	12-56	Cap., fixed, ceramic disc, .01 µf, GMV, 25V	56289	HY 520
A4C19	12-74	Cap., fixed, disc ceramic, .022µf, ±20%, 50V	72982	8131-050-W5R-223M
A4C20	12-21	Cap., fixed, ceramic, 27 pf, ±10%, 1KV	91418	N750
A4C21	13-70	Cap., fixed, Tantalum, Electrolytic, 1.0 µf, ±10%, 35 WVDC	22229	K1C35K
A4C22 and A4C23	12-56	Cap., fixed, ceramic disc, .01 µf, GMV, 25V	56289	HY 520
A4C24	13-70	Cap., fixed, Tantalum, Electrolytic, 1.0 µf, ±10%, 35 WVDC	22229	K1C35K
A4C25	12-56	Cap., fixed, ceramic disc, .01 µf, GMV, 25V	56289	HY 520
A4C26	12-74	Cap., fixed, disc ceramic, .022µf, ±20%, 50V	72982	8131-050-W5R-223M
A4C27	12-47	Cap., fixed, ceramic 120 pf, ±10%, 1KV	72982	831-X5R-121K
A4C28	13-69	Cap., fixed, Tantalum, Electroltie, 4.7 µf, ±10%, 35 WVDC	22229	K4R7C35K

A4 VIDEO AMPLIFIER ASSEMBLY

CIRCUIT REFERENCE	ALFRED PART NO.	DESCRIPTION	TRUE MFR. FSC NO.	TRUE MFR. PART NO.
		CAPACITORS (Con't)		
A4C29 and A4C30	12-56	Cap., fixed, ceramic disc, .01 µf, GMV, 25 V	56289	HY 520
A4C31	13-70	Cap., fixed, Tantalum, Electrolytic, 1.0 µf, ±10%, 35 WVDC	22229	K1C35K
A4C32	12-56	Cap., fixed, ceramic disc, .01 µf, GMV, 25V	56289	HY 520
A4C33	12-72	Cap., fixed, ceramic, 0.1 µf, ±20%, 50V		
A4C34	13-70	Cap., fixed, Tantalum, Electrolytic, 1.0 µf, ±10%, 35 WVDC	22229	K1C35K
A4C35	12-56	Cap., fixed, ceramic disc, .01 µf, GMV, 25V	56289	HY 520
A4C36	13-83	Cap., fixed, Tantalum, Electrolytic, 150 µf, ±20%, 4 WVDC	56289	196D 157X 000 6LA3
A4C37 thru A4C41	12-56	Cap., fixed, ceramic disc, .01 µf, GMV, 25V	56289	HY 520
A4C42 and A4C43	12-54	Cap., feedthru .001 µf, GMV, 100V	00656	EF5
A4C44 thru A4C46	13-70	Cap., fixed, Tantalum, Electrolytic, 1.0 µf, ±10%, 35 WVDC	22229	K1C35K
A4C47	12-56	Cap., fixed, ceramic disc, .01 µf, GMV, 25V	56289	HY 520
A4C48	13-70	Cap., fixed, Tantalum, Electrolytic, 1.0 µf, ±10%, 35 WVDC	22229	K1C35K
A4C49	12-21	Cap., fixed, ceramic, 27 pf, ±10%, 1KV	91418	N750
A4C50	12-56	Cap., fixed, ceramic disc, .01 µf, GMV, 25V	56289	HY 520
A4C51	13-70	Cap., fixed, Tantalum, Electrolytic, 1.0 µf, ±10%, 35 WVDC	22229	K1C35K
A4C52	13-82	Cap., fixed, Aluminum, Electrolytic, 35 µf, +80 - 20%, 25 WVDC	56289	TE 1208
A4C53	13-70	Cap., fixed, Tantalum, Electrolytic, 1.0 µf, ±10%, 35 WVDC	22229	K1C35K
A4C54	23-10	Cap., variable, ceramic, 15 - 60 pf	72982	538-011-F-15-60
A4C55	11-25	Cap., fixed, dipped mica, 47 pf, ±5%, 500V	00853	D15-5-E-470-J
		DIODES		
A4CR1	81-260	Diode, 1N4148	14552	1N4148
A4CR2 and A4CR3	81-196	Diode, Hot-Carrier (HP 2900)	80104	5082-2900
A4CR4	81-260	Diode, 1N4148	14552	1N4148
		CONNECTORS		
A4J1 and A4J2	131-46	Connector, RF, Coaxial, RT Angle	24931	P5020
		INDUCTORS		
A4L1	92-52	Coil, RF, 210 NH, ±5%	71895	TBA (Ser. 1025)
A4L2	92-53	Coil, RF, 200 NH, ±5%	71895	TBA (Ser. 1025)
A4L3	92-54	Coil, RF, 180 NH, ±5%	71895	TBA (Ser. 1025)
A4L4	92-51	Coil, RF, 0.47 µh, ±10%	71895	1025-12
		TRANSISTORS		
A4Q1	81-272	Transistor, 2N5179	86684	2N5179
A4Q2 thru A4Q5	81-131	Transistor, 2N3563	07263	2N3563
A4Q6	81-272	Transistor		
A4Q7	81-140	Transistor, 2N5087	04713	2N5087
		RESISTORS		
A4R1	34-56	Res., fixed, comp., 56 ohms, ±5%, 1/4 W	01121	CS 5635
A4R2	34-3.3K	Res., fixed, comp., 3.3K, ±5% 1/4 W	01121	CS 3325
A4R3	34-4.7K	Res., fixed, comp., 4.7K, ±5%, 1/4 W	01121	CS 4725

A4 VIDEO AMPLIFIER ASSEMBLY

CIRCUIT REFERENCE	ALFRED PART NO.	DESCRIPTION	TRUE MFR. FSC NO.	TRUE MFR. PART NO.
		RESISTORS (Con't)		
A4R4 and A4R5	34-1K	Res., fixed, comp., 1K, ±5%, 1/4 W	01121	CS 1025
A4R6	34-3.9K	Res., fixed, comp., 3.9K, ±5% 1/4 W	01121	CS 3925
A4R7	34-330	Res., fixed, comp., 330 ohms, ±5%, 1/4 W	01121	CS 3315
A4R8	34-22K	Res., fixed, comp., 22K, ±5%, 1/4 W	01121	CS 2235
A4R9	34-5.6K	Res., fixed, comp., 5.6K, ±5%, 1/4 W	01121	CS 5625
A4R10 and A4R11	34-330	Res., fixed, comp., 330 ohms, ±5%, 1/4 W	01121	CS 3315
A4R12 and A4R13	41-680	Res., fixed, comp., 680 ohms, ±10%, 1/2 W	01121	EB 6811
A4R14	34-1.2K	Res., fixed, comp., 1.2K, ±5% 1/4 W	01121	CS 1225
A4R15	41-820	Res., fixed, comp., 820 ohms, ±10%, 1/2 W	01121	EB 8211
A4R16	41-1K	Res., fixed, comp., 1K, ±10%, 1/2 W	01121	EB 1021
A4R17	34-12	Res., fixed, comp., 12 ohms, ±5%, 1/4 W	01121	CS 3435
A4R18	41-820	Res., fixed, comp., 820 ohms, ±10%, 1/2 W	01121	EB 8211
A4R19	41-1K	Res., fixed, comp., 1K, ±10%, 1/2 W	01121	EB 1021
A4R20	34-1.2K	Res., fixed, comp., 1.2K, ±5%, 1/4 W	01121	CS 1225
A4R21	34-4.7K	Res., fixed, comp., 4.7K, ±5%, 1/4 W	01121	CS 4725
A4R22	34-56K	Resistor, fixed, comp., 56K, ±5%, 1/4 W	01121	CS 5635
A4R23	34-390	Res., fixed, comp., 390 ohms, ±5%, 1/4 W	01121	CS 3915
A4R24	34-4.7K	Res., fixed, comp., 4.7K, ±5%, 1/4 W	01121	CS 4725
A4R25	34-82	Res., fixed, comp., 82 ohms, ±5%, 1/4 W	01121	CS 8235
A4R26	34-2.7K	Res., fixed, comp., 2.7K, ±5%, 1/4 W	01121	CS 2725
A4R27	34-33K	Res., fixed, comp., 33K, ±5%, 1/4 W	01121	CS 3335
A4R28	34-180	Res., fixed, comp., 180 ohms, ±5%, 1/4 W	01121	CS 1815
A4R29	34-1.8K	Res., fixed, comp., 1.8K, ±5%, 1/4 W	01121	CS 1825
A4R30 and A4R31	34-56	Res., fixed, comp., 56 ohms, ±5%, 1/4 W	01121	CS 5635
A4R32	34-4.7	Res., fixed, comp., 4.7 ohms, ±5%, 1/4 W	01121	CS 4725
A4R33	34-47	Res., fixed, comp., 47 ohms, ±5%, 1/4 W	01121	CS 4735
A4R34	34-120K	Res., fixed, comp., 120K, ±5%, 1/4 W	01121	CS 1215
A4R35	34-560	Res., fixed, comp., 560 ohms, ±5%, 1/4 W	01121	CS 5615
A4R36 and A4R37	34-100	Res., fixed, comp., 100 ohms, ±5%, 1/4 W	01121	CS 1015
A4R38	34-4.7K	Res., fixed, comp., 4.7K, ±5%, 1/4 W	01121	CS 4725
A4R39	71-92	Res., variable wirewound, 20K, ±10%	21030	79PR20K
		FERRITE BEAD		
A4Z1 thru A4Z10	191-53	Ferrite Bead	02114	5659065/3B

A5A1 25 MHz OSCILLATOR AND DIVIDER ASSEMBLY

CIRCUIT REFERENCE	ALFRED PART NO.	DESCRIPTION	TRUE MFR. FSC NO.	TRUE MFR. PART NO.
		INTEGRATED CIRCUIT		
A5A1A1 thru A5A1A3	84-5	Integrated Circuit, J - K Flip-Flop	04713	MC1013P
		CAPACITORS		
A5A1C1 thru A5A1C3	12-56	Cap., fixed, ceramic, disc, .01 µf, GMV, 25V	56289	HY 520
A5A1C4		Not used		
A5A1C5	11-48	Cap., fixed, dipped, mica, 39 pf, ±5%, 500 WVDC	72136	DM15-390J
A5A1C6	23-9	Cap., variable, ceramic, 5-25 pf	73899	DU J300
A5A1C7	11-45	Cap., fixed, dipped mica, 51 pf, ±2%, 500V	72136	DM15-510G
A5A1C8 thru A5A1C10	12-56	Cap., fixed, ceramic, disc, .01 µf, GMV, 25V	56289	HY 520
A5A1C11	11-6	Cap., fixed, dipped mica, 15 pf, ±5%, 500V	00853	CM15B15003
A5A1C12 thru A5A1C15	12-56	Cap., fixed, ceramic disc, .01 µf, GMV, 25V	56289	HY 520
A5A1C16	12-22	Cap., fixed, ceramic disc, 100 pf, ±10%, 1KV	72982	E100KX5F
A5A1C17	12-56	Cap., fixed, ceramic disc, .01 µf, GMV, 25V	56289	HY 520
A5A1C18	11-21	Cap., fixed, dipped mica, 27 pf, ±5%, 500V	00853	D155E270J
A5A1C19	12-18	Cap., fixed, ceramic disc, 200 pf, ±10%, 1KV	71982	EX5F200K
A5A1C20	12-56	Cap., fixed, ceramic disc, .01 µf, GMV, 25V	56289	HY 520
A5A1C21	12-72	Cap., fixed, ceramic, 0.1 µf, ±20%, 50V		
A5A1C22	12-18	Cap., fixed, ceramic disc, 200 pf, ±10%, 1KV	71982	EX5F200K
A5A1C23	12-56	Cap., fixed, ceramic disc, .01 µf, GMV, 25V	56289	HY 520
A5A1C24	12-72	Cap., fixed, ceramic, 0.1 µf, ±20% 50V		
A5A1C25	12-42	Cap., fixed, ceramic disc, 390 pf, ±10%, 1KV	71590	DD 390
A5A1C26		Not used		
A5A1C27	12-56	Cap., fixed, ceramic disc, .01 µf, GMV, 25V	56289	HY 520
A5A1C28	12-72	Cap., fixed, ceramic, 0.1 µf, 20%, 50V		
A5A1C29	12-21	Cap., fixed, ceramic disc, 27 pf, ±5%, 1000V	91418	N750
A5A1C30	12-56	Cap., fixed, ceramic disc, .01 µf, GMV, 25V	56289	HY 520
A5A1C31	12-72	Cap., fixed, ceramic, 0.1 µf, ±20%, 50V	72982	8131-100W5R-104M
A5A1C32	13-70	Cap., fixed, Tantalum, Electrolytic, 1.0 µf, ±20%, 35 WVDC	22229	K1C35K
A5A1C33	12-72	Cap., fixed, ceramic, 0.1 µf, ±20%, 50V	72982	8131-100W5R-104M
A5A1C34	12-22	Cap., fixed, ceramic disc, 100 pf, ±10%, 1KV	72982	E100KX5F
A5A1C35	12-56	Cap., fixed, ceramic, disc, .01 µf, GMV, 25V	56289	HY 520
A5A1C36	11-20	Cap., fixed, dipped mica, 5 pf, ±5%, 500V	00853	D15-5-E-050-J-0
A5A1C37	12-42	Cap., fixed, ceramic disc, 39 pf, ±10%, 1000V	71590	DD 390
A5A1C38 and A5A1C39	12-56	Cap., fixed, ceramic disc, .01 µf, GMV, 25V	56289	HY 520

A5A1 25 MHz OSCILLATOR AND DIVIDER ASSEMBLY

CIRCUIT REFERENCE	ALFRED PART NO.	DESCRIPTION	TRUE MFR. FSC NO.	TRUE MFR. PART NO.
		DIODES		
A5A1CR1	81-269	Diode, zener, 5.1V, ±10%, 500 MW, 1N5231	04713	1N5231A
A5A1CR2 and A5A1CR3	81-196	Diode, Hot Carrier (HP 2900)	80104	5082-2900
		CONNECTORS		
A5A1J1 and A5A1J2		Not used		
A5A1J3 thru A5A1J5	131-46	Connector, RF RT Angle, Min., 50 ohms	24931	P5020
		INDICATORS		
A5A1L1	92-7	Coil, RF, Molded, 10 µh, ±10%	71895	1025-44
A5A1L2	92-47	Coil, RF, Molded, 0.68 µh, ±10%	71895	1025-16
A5A1L3	92-46	Coil, RF, variable, shielding, 0.48 to 1.0 µh	71895	435-2
A5A1L4	92-6	Coil, RF, Molded, 2.2 µh, ±10%	71895	1025-28
A5A1L5 and A5A1L6	92-7	Coil, RF, Molded, 10 µh, ±10%	71895	1025-44
A5A1L7	92-48	Coil, RF, Molded, 0.15 µf, ±10%	71895	1025-00
A5A1L8 and A5A1L9	92-37	Coil, RF, 1.0 MH, ±10%	71895	1025-92
A5A1L10	92-7	Coil, RF, Molded, 10 µh, ±10%	71895	1025-44
		TRANSISTORS		
A5A1Q1 thru A5A1Q8	81-131	Transistor, 2N3563	07263	2N3563
		RESISTORS		
A5A1R1	34-1.5K	Res., fixed, comp., 1.5K, ±5%, 1/4 W	01121	CS 1525
A5A1R2	41-1.8K	Res., fixed, comp., 1.8K, ±10%, 1/2 W	01121	EB 1821
A5A1R3 and A5A1R4	34-1K	Res., fixed, comp., 1K, ±5%, 1/4 W	01121	CS 1025
A5A1R5 thru A5A1R8	34-3.3K	Res., fixed, comp., 3.3K, ±5%, 1/4 W	01121	CS 3325
A5A1R9	34-470	Res., fixed, comp., 470 ohms, ±5%, 1/4 W	01121	CS 4715
A5A1R10	34-82	Res., fixed, comp., 82 ohms, ±5%, 1/4 W	01121	CS 8235
A5A1R11	34-680	Res., fixed, comp., 680 ohms, ±5%, 1/4 W	01121	CS 6815
A5A1R12	34-2.2K	Res., fixed, comp., 2.2K, ±5%, 1/4 W	01121	CS 2225
A5A1R13	34-1K	Res., fixed, comp., 1K, ±5%, 1/4 W	01121	CS 1025
A5A1R14	34-560	Res., fixed, comp., 560 ohms, ±5%, 1/4 W	01121	CS 5615
A5A1R15	34-1K	Res., fixed, comp., 1K, ±5%, 1/4 W	01121	CS 1025
A5A1R16	34-180	Res., fixed, comp., 180 ohms, ±5%, 1/4 W	01121	CS 1815
A5A1R17 thru A5A1R20	34-15K	Res., fixed, comp., 15K, ±5%, 1/4 W	01121	CS 1535
A5A1R21	34-1.8K	Res., fixed, comp., 1.8K, ±5%, 1/4 W	01121	CS 1825
A5A1R22	34-10K	Res., fixed, comp., 10K, ±5%, 1/4 W	01121	CS 1035
A5A1R23		Not used		
A5A1R24	34-180	Res., fixed, comp., 180 ohms, ±5%, 1/4 W	01121	CS 1815
A5A1R25		Not used		
A5A1R26	34-1.8K	Res., fixed, comp., 1.8K, ±5%, 1/4 W	01121	CS 1825
A5A1R27	34-10K	Res., fixed, comp., 10K, ±5%, 1/4 W	01121	CS 1035
A5A1R28 and A5A1R29	34-56	Res., fixed, comp., 56 ohms, ±5% 1/4 W	01121	CS 5635
A5A1R30	34-220	Res., fixed, comp., 220 ohms, ±5% 1/4 W	01121	CS 2215

A5A1 25 MHz OSCILLATOR AND DIVIDER ASSEMBLY

CIRCUIT REFERENCE	ALFRED PART NO.	DESCRIPTION	TRUE MFR. FSC NO.	TRUE MFR. PART NO.
		RESISTORS (Con't)		
A5A1R31 and A5A1R32	34-1K	Res., fixed, comp., 1K, ±5%, 1/4 W	01121	CS 1025
A5A1R33	34-27	Res., fixed, comp., 27 ohms, ±5%, 1/4 W	01121	CS 2735
A5A1R34 and A5A1R35	41-1.8K	Res., fixed, comp., 1.8K, ±10%, 1/2 W	01121	EB 1821
A5A1R36	34-1K	Res., fixed, comp., 1K, ±5%, 1/4 W	01121	CS 1025
A5A1R37	34-56	Res., fixed, comp., 56 ohms, ±5%, 1/4 W	01121	CS 5635
A5A1R38 and A5A1R39	34-1K	Res., fixed, comp., 1K, ±5%, 1/4 W	01121	CS 1025
A5A1R40 and A5A1R41	34-10K	Res., fixed, comp., 10K, ±5%, 1/4 W	01121	CS 1035
A5A1R42	34-820	Res., fixed, comp., 820 ohms, ±5%, 1/4 W	01121	CS 8215
A5A1R43	34-33	Res., fixed, comp., 33 ohms, ±5% 1/4 W	01121	CS 3335
A5A1R44	43-150	Res., fixed, comp., 150 ohms, ±10%, 2 W	01121	HB 1511
A5A1R45	34-1K	Res., fixed, comp., 1K, ±5%, 1/4 W	01121	CS 1025
A5A1R46 and A5A1R47	34-820	Res., fixed, comp., 820 ohms, ±5%, 1/4 W	01121	CS 8215
		CRYSTALS		
A5A1Y1	83-3	Crystal, 25.000 MHz	71034	0 -55° Series
		FERRITE BEADS		
A5A1Z1	191-53	Ferrite beads		

A5A2 PULSE AMPLIFIER ASSEMBLY

CIRCUIT REFERENCE	ALFRED PART NO.	DESCRIPTION	TRUE MFR. FSC NO.	TRUE MFR. PART NO.
		CAPACITORS		
A5A2C1	12-56	Cap., fixed, ceramic, .01 µf, GMV, 25V	56289	HY 520
A5A2C2	13-5.6	Cap., fixed, Tantalum, Electrolytic, 5.6 µf, ±20%, 35 WVDC		
A5A2C3	12-56	Cap., fixed, ceramic, .01 µf, GMV, 25V	56289	HY 520
A5A2C4 and A5A2C5	12-14	Cap., fixed, ceramic, .0012 µf, ±10%, 600V	56289	TS D12
A5A2C6	12-72	Cap., fixed, ceramic, 0.1 µf, ±20%, 50V	72982	8131-100-W5R-104M
A5A2C7 and A5A2C8	12-56	Cap., fixed, ceramic, .01 µf, GMV, 25V	56289	HY 520
A5A2C9	12-24	Cap., fixed, ceramic, 390 pf, ±10%, 1KV	71982	EX5F390K
A5A2C10	12-56	Cap., fixed, ceramic, .01 µf, GMV, 25V	56289	HY 520
A5A2C11	13-88	Cap., fixed, Tantalum, Electrolytic, 5.6 µf, ±20%, 35 WVDC	56289	150B565X903B2
A5A2C12	12-56	Cap., fixed, ceramic, .01 µf, GMV, 25V	56289	HY 520
A5A2C13 and A5A2C14	12-14	Cap., fixed, ceramic, .0012 µf, ±10%, 600V	56289	TS D12
A5A2C15	12-56	Cap., fixed, ceramic, .01 µf, GMV, 25V	56289	HY 520
A5A2C16	12-72	Cap., fixed, ceramic, 0.1 µf, ±20%, 50V	72982	8131-100-W5R-104M
A5A2C17 and A5A2C18	12-56	Cap., fixed, ceramic, .01 µf, GMV, 25V	56289	HY 520
A5A2C19	12-24	Cap., fixed, ceramic, 390 pf, ±10%, 1KV	71982	EX5F390K
A5A2C20	12-56	Cap., fixed, ceramic, .01 µf, GMV, 25V	56289	HY 520

A5A2 PULSE AMPLIFIER ASSEMBLY

CIRCUIT REFERENCE	ALFRED 'ART NO	DESCRIPTION	TRUE MFR. FSC NO.	TRUE MFR. PART NO.
		CAPACITORS (Con't)		
A5A2C21	13-88	Cap., fixed, Tantalum, Electrolytic, 5.6 µf, ±20%, 35 WVDC	56289	150B565X903B2
A5A2C22	12-56	Cap., fixed, ceramic, .01 µf, GMV, 25V	56289	HY 520
A3A2C23 and A5A2C24	12-14	Cap., fixed, ceramic, .0012 µf, ±10%, 600V	56289	TS D12
A5A2C25	12-72	Cap., fixed, ceramic, 0.1 µf, ±20%, 50V	72982	8131-100-W5R-104M
A5A2C26 and A5A2C27	12-56	Cap., fixed, ceramic, .01 µf, GMV, 25V	56289	HY 520
A5A2C28	12-24	Cap., fixed, ceramic, 390 pf, ±10%, 1KV	71982	EX5F390K
A5A2C29 and A5A2C30	12-56	Cap., fixed, ceramic, .01 µf, GMV, 25V	56289	HY 520
		CONNECTORS		
A5A2J1 and A5A2J2	131-46	Connector, RF, Right Angle, Miniature, 50 ohms		
		INDICATORS		
A5A2L1 thru A5A2L3	92-19	Coil, RF, 100 µh, ±10%	71895	1025-68
		TRANSISTORS		
A5A2Q1	81-195	Transistor, 2N5088	04713	2N5088
A5A2Q2 thru A5A2Q4	81-116	Transistor, 2N3646	07263	2N3646
A5A2Q5	81-129	Transistor, 2N3645	07236	2N3645
A5A2A6	81-116	Transistor, 2N3646	07263	2N3646
A5A2Q7 and A5A2Q8	81-195	Transistor, 2N5088	04713	2N5088
A5A2Q9 thru A5A2Q11	81-116	Transistor, 2N3646	07263	2N3646
A5A2Q12	81-129	Transistor, 2N3645	07263	2N3645
A5A2Q13	81-116	Transistor, 2N3646	07263	2N3646
A5A2Q14	81-195	Transistor, 2N5088	04713	2N5088
A5A2Q15 thru A5A2Q17	81-116	Transistor, 2N3646	07263	2N3646
A5A2Q18	81-129	Transistor, 2N3645	07263	2N3645
A5A2Q19	81-116	Transistor, 2N3646	07263	2N3646
A5A2Q20 an A5A2Q21	81-140	Transistor, 2N5087	04713	2N5087
A5A2Q22	81-195	Transistor, 2N5088	04713	2N5088
		RESISTORS		
A5A2R1	34-1K	Res., fixed, comp., 1K, ±5%, 1/4 W	01121	CS 1025
A5A2R2	34-56K	Res., fixed, comp., 56K, ±5%, 1/4 W	01121	CS 5635
A5A2R3	34-15K	Res., fixed, comp., 15K, ±5%, 1/4 W	01121	CS 1535
A5A2R4	34-4.7K	Res., fixed, comp., 4.7K, ±5%, 1/4 W	01121	CS 4725
A5A2R5	71-95	Res., variable, wirewound, 10T, 2K, ±10%, 1 W	21030	79PR2K
A5A2R6	34-2.2K	Res., fixed, comp., 2.2K, ±5%, 1/4 W	01121	CS 2225
A5A2R7	34-10K	Res., fixed, comp., 10K, ±5%, 1/4 W	01121	CS 1035
A5A2R8	34-4.7K	Res., fixed, comp., 4.7K, ±5%, 1/4 W	01121	CS 4725
A5A2R9	34-1.8K	Res., fixed, comp., 1.8K, ±5%, 1/4 W	01121	CS 1825
A5A2R10	34-2.2K	Res., fixed, comp., 2.2K, ±5%, 1/4 W	01121	CS 2225
A5A2R11	34-15K	Res., fixed, comp., 15K, ±5%, 1/4 W	01121	CS 1535
A5A2R12	34-8.2K	Res., fixed, comp., 8.2K, ±5%, 1/4 W	01121	CS 8225
A5A2R13	34-1.8K	Res., fixed, comp., 1.8K, ±5%, 1/4 W	01121	CS 1825
A5A2R14	34-560	Res., fixed, comp., 560 ohms, ±5% 1/4 W	01121	CS 5615

A5A2 PULSE AMPLIFIER ASSEMBLY

CIRCUIT REFERENCE	ALFRED PART NO.	DESCRIPTION	TRUE MFR. FSC NO.	TRUE MFR. PART NO.
		RESISTORS (Con't)		
A5A2R15	34-330	Res., fixed, comp., 330 ohms, ±5%, 1/4 W	01121	CS 3315
A5A2R16	34-5.6K	Res., fixed, comp., 5.6K, ±5%, 1/4 W	01121	CS 5625
A5A2R17	34-1K	Res., fixed, comp., 1K, ±5%, 1/4 W	01121	CS 1025
A5A2R18	34-4.7K	Res., fixed, comp., 4.7K, ±5%, 1/4 W	01121	CS 4725
A5A2R19	34-8.2K	Res., fixed, comp., 8.2K, ±5%, 1/4 W	01121	CS 8225
A5A2R20	34-1K	Res., fixed, comp., 1K, ±5%, 1/4 W	01121	CS 1025
A5A2R21	34-56K	Res., fixed, comp., 56K, ±5%, 1/4 W	01121	CS 5635
A5A2R22	34-10K	Res., fixed, comp., 10K, ±5%, 1/4 W	01121	CS 1035
A5A2R23	34-4.7K	Res., fixed, comp., 4.7K, ±5%, 1/4 W	01121	CS 4725
A5A2R24	34-1.2K	Res., fixed, comp., 1.2K, ±5%, 1/4 W	01121	CS 1225
A5A2R25	34-56K	Res., fixed, comp., 56K, ±5%, 1/4 W	01121	CS 5635
A5A2R26	34-15K	Res., fixed, comp., 15K, ±5%, 1/4 W	01121	CS 1535
A5A2R27	34-4.7K	Res., fixed, comp., 4.7K, ±5%, 1/4 W	01121	CS 4725
A5A2R28	71-95	Res., variable, wirewound, 10T, 2K, ±10%, 1 W	21030	79PR2K
A5A2R29	34-2.2K	Res., fixed, comp., 2.2K, ±5%, 1/4 W	01121	CS 2225
A5A2R30	34-10K	Res., fixed, comp., 10K, ±5%, 1/4 W	01121	CS 1035
A5A2R31	34-4.7K	Res., fixed, comp., 4.7K, ±5%, 1/4 W	01121	CS 4725
A5A2R32	34-1.8K	Res., fixed, comp., 1.8K, ±5%, 1/4 W	01121	CS 1825
A5A2R33	34-2.2K	Res., fixed, comp., 2.2K, ±5%, 1/4 W	01121	CS 2225
A5A2R34	34-15K	Res., fixed, comp., 15K, ±5%, 1/4 W	01121	CS 1535
A5A2R35	34-8.2K	Res., fixed, comp., 8.2K, ±5%, 1/4 W	01121	CS 8225
A5A2R36	34-1.8K	Res., fixed, comp., 1.8K, ±5%, 1/4 W	01121	CS 1825
A5A2R37	34-560	Res., fixed, comp., 560 ohms, ±5%, 1/4 W	01121	CS 5615
A5A2R38	34-330	Res., fixed, comp., 330 ohms, ±5%, 1/4 W	01121	CS 3315
A5A2R39	34-5.6K	Res., fixed, comp., 5.6K, ±5%, 1/4 W	01121	CS 5625
A5A2R40	34-1K	Res., fixed, comp., 1K, ±5%, 1/4 W	01121	CS 1025
A5A2R41	34-4.7K	Res., fixed, comp., 4.7K, ±5%, 1/4 W	01121	CS 4725
A5A2R42	34-8.2K	Res., fixed, comp., 8.2K, ±5%, 1/4 W	01121	CS 8225
A5A2R43	34-1K	Res., fixed, comp., 1K, ±5%, 1/4 W	01121	CS 1025
A5A2R44	34-56K	Res., fixed, comp., 56K, ±5%, 1/4 W	01121	CS 5635
A5A2R45	34-15K	Res., fixed, comp., 15K, ±5%, 1/4 W	01121	CS 1535
A5A2R46	34-4.7K	Res., fixed, comp., 4.7K, ±5%, 1/4 W	01121	CS 4725
A5A2R47	71-95	Res., variable, wirewound, 10%, 2K, ±10%, 1 W	21030	79PR2K
A5A2R48	34-2.2K	Res., fixed, comp., 2.2K, ±5%, 1/4 W	01121	CS 2225
A5A2R49	34-10K	Res., fixed, comp., 10K, ±5%, 1/4 W	01121	CS 1035
A5A2R50	34-4.7K	Res., fixed, comp., 4.7K, ±5%, 1/4 W	01121	CS 4725
A5A2R51	34-1.8K	Res., fixed, comp., 1.8K, ±5%, 1/4 W	01121	CS 1825
A5A2R52	34-2.2K	Res., fixed, comp., 2.2K, ±5%, 1/4 W	01121	CS 2225
A5A2R53	34-15K	Res., fixed, comp., 15K, ±5%, 1/4 W	01121	CS 1535
A5A2R54	34-8.2K	Res., fixed, comp., 8.2K, ±5%, 1/4 W	01121	CS 8225

A5A2 PULSE AMPLIFIER ASSEMBLY

CIRCUIT REFERENCE	ALFRED PART NO.	DESCRIPTION	TRUE MFR. FSC NO.	TRUE MFR. PART NO.
		RESISTORS (Con't)		
A5A2R55	34-1.8K	Res., fixed, comp., 1.8K, ±5%, 1/4 W	01121	CS 1825
A5A2R56	34-560	Res., fixed, comp., 560 ohms, ±5%, 1/4 W	01121	CS 5615
A5A2R57	34-330	Res., fixed, comp., 330 ohms, ±5%, 1/4 W	01121	CS 3315
A5A2R58	34-5.6K	Res., fixed, comp., 5.6K, ±5%, 1/4 W	01121	CS 5625
A5A2R59	34-1K	Res., fixed, comp., 1K, ±5%, 1/4 W	01121	CS 1025
A5A2R60	34-4.7K	Res., fixed, comp., 4.7K, ±5%, 1/4 W	01121	CS 4725
A5A2R61	34-8.2K	Res., fixed, comp., 8.2K, ±5%, 1/4 W	01121	CS 8225
A5A2R62	34-6.8K	Res., fixed, comp., 6.8K, ±5%, 1/4 W	01121	CS 6825
A5A2R63	34-82K	Res., fixed, comp., 82K, ±5%, 1/4 W	01121	CS 8235
A5A2R64	71-93	Res., variable, wirewound, 10T, 10K, ±10%, 1 W	21030	79PR10K
A5A2R65	34-82K	Res., fixed, comp., 82K, ±5%, 1/4 W	01121	CS 8235
A5A2R66 and A5A2R67	59-10.0K	Res., fixed, metal film, 10K, ±1%, 1/4 W	19701	MF5C-E-10.0K-F
A5A2R68 and A5A2R69	34-10K	Res., fixed, comp., 10K, ±5%, 1/4 W	01121	CS 1035
A5A2R70 and A5A2R71	34-4.7K	Res., fixed, comp., 4.7K, ±5%, 1/4 W	01121	CS 4725

A6 EXTERNAL MARKER ASSEMBLY

CIRCUIT REFERENCE	ALFRED PART NO.	DESCRIPTION	TRUE MFR. FSC NO.	TRUE MFR. PART NO.
		INTEGRATED CIRCUITS		
A6A1	84-8	Integrated Circuit, Wideband Amplifier	86684	CA 3012
		CAPACITORS		
A6C1	12-56	Cap., fixed, disc ceramic, .01 µf, GMV, 25V	56289	HY 520
A6C2	12-72	Cap., fixed, ceramic, .01 µf, ±20%, 25V	72982	8131-100-W5R-104M
A6C3	13-70	Cap., fixed, Tantalum, Electrolytic, 1.0 µf, ±20%, 35V	22229	K1C35K
A6C4 and A6C5	12-56	Cap., fixed, disc, ceramic, .01 µf, GMV, 25V	56289	HY 520
A6C6 thru A6C8	13-70	Cap., fixed, Tantlum, Electrolytic, 1.0 µf, ±20%, 35V	22229	K1C35K
A6C9	12-15	Cap., fixed, disc ceramic, .002 µf, ±10%, 1KV	71590	DD-202
A6C10	11-34	Cap., fixed, dipped, mica, 100 pf, ±5%, 500V	00853	D153E101G
A6C11	11-44	Cap., fixed, dipped, mica, 300 pf, ±5%, 500V	72136	DM15-301J
A6C12	11-45	Cap., fixed, dipped, mica, 51 pf, ±2%, 500V	72136	DM15-510G
A6C13	11-47	Cap., fixed, dipped, mica, 390 pf, ±5%, 500V	72136	DM15-391J
A6C14	11-44	Cap., fixed, dipped, mica, 300 pf, ±5%, 500V	72136	DM15-301J
A6C15	11-46	Cap., fixed, dipped, mica, 330 pf, ±5%, 500V	72136	DM15-301J
A6C16 and A6C17	11-43	Cap., fixed, dipped mica, 200 pf, ±5%, 500V	72136	DM15-201J
A6C18	12-56	Cap., fixed, disc, ceramic, .01 µf, GMV 25V	56289	HY 520
A6C19	12-72	Cap., fixed, ceramic, 0.1 µf, ±20%, 50V	72982	8131-100-W5R-104M

A6 EXTERNAL MARKER ASSEMBLY

CIRCUIT REFERENCE	ALFRED PART NO.	DESCRIPTION	TRUE MFR. FSC NO.	TRUE MFR. PART NO.
		CAPACITORS (Con't)		
A6C20 and A6C21	12-56	Cap., fixed, disc, ceramic, .01 µf, GMV, 25V	56289	HY 520
A6C22	13-70	Cap., fixed, Tantalum, Electrolytic, 1.0 µf, ±20%, 35V	22229	K1C35K
A6C23	12-76	Cap., fixed, ceramic, .033 µf, ±20%, 50V	72982	8131-050-W5R-333M
A6C24	12-27	Cap., fixed, disc, ceramic, 270 pf, ±10%, 1KV	71590	DD 271
A6C25 and A6C26	12-17	Cap., fixed, disc, ceramic, .005 µf, ±10%, 1KV	71590	DD 502
A6C27 and A6C28	12-56	Cap., fixed, disc, ceramic, .01 µf, GMV, 25V	56289	HY 520
A6C29 and A6C30	12-72	Cap., fixed, ceramic, 0.1 µf, ±20%, 50V	72982	8131-100-W5R-104M
A6C31	12-56	Cap., fixed, disc ceramic, .01 µf, GMV, 25V	56289	HY 520
A6C32	11-35	Cap., fixed, dipped mica, 39 pf, ±2%	00853	D153E390G
A6C33	12-56	Cap., fixed, disc, ceramic, .01 µf, GMV, 25V	56289	HY 520
A6C34	12-56	Cap., fixed, disc ceramic, 500 pf, ±10%, 1KV	56289	HY520
A6C35	13-88	Cap., fixed, Tantalum, Electrolytic, 5.6 µf, ±20%, 35 WVDC	56289	150D-565X90-3B2
		DIODES		
A6CR1 and A6CR2	81-196	Diode, Hot-Carrier	80104	5082-2900
		CONNECTORS		
A6J1 thru A6J3	131-46	Connector, RF, Right Angle, Minature, 50 ohms	24931	P5020
		INDICATORS		
A6L1	92-19	Coil, RF, 100 µh, ±10%	71895	1025-68
A6L2	92-5	Coil, RF, 33 µh, ±10%	71895	1025-56
A6L3	92-7	Coil, RF, 10 µh, ±10%	71895	1025-44
A6L4	92-49	Coil, RF, 18 µh, ±10%	71895	1025-50
A6L5	92-7	Coil, RF, 10 µh, ±10%	71895	1025-44
A6L6	92-50	Coil, RF, 12 µh, ±10%	71895	1025-46
A6L7 and A6L8	92-19	Coil, RF, 100 µh, ±10%	71895	1025-68
		TRANSISTORS		
A6Q1	81-131	Transistor, 2N3563	07263	2N3563
A6Q2 thru A6Q4	81-189	Transistor, 2N4917	07263	2N4917
A6Q5 and A6Q6	81-195	Transistor, 2N5088	04713	2N5088
A6Q7 thru A6Q9	81-116	Transistor, 2N3646	07263	2N3646
A6Q10	81-129	Transistor, 2N3645	07263	2N3645
A6Q11	81-116	Transistor, 2N3646	07263	2N3646
		RESISTORS		
A6R1	34-470	Res., fixed, comp., 470 ohms, ±5%, 1/4 W	01121	CS 4715
A6R2	34-120	Res., fixed, comp.,120 ohms, ±5%, 1/4 W	01121	CS 1215
A6R3	34-180	Res., fixed, comp., 180 ohms, ±5%, 1/4 W	01121	CS 1815
A6R4	41-680	Res., fixed, comp., 680 ohms, ±10%, 1/2 W	01121	EB 6811
A6R5	34-3.9K	Res., fixed, comp., 3.9K, ±5%, 1/4 W	01121	CS 3925
A6R6	34-270	Res., fixed, comp., 270 ohms, ±5%, 1/4 W	01121	CS 2715
A6R7	34-330	Res., fixed, comp., 330 ohms, ±5%, 1/4 W	01121	CS 3315

A6 EXTERNAL MARKER ASSEMBLY

CIRCUIT REFERENCE	ALFRED PART NO.	DESCRIPTION	TRUE MFR. FSC NO.	TRUE MFR. PART NO.
		RESISTORS (Con't)		
A6R8 and A6R9	34-3.9K	Res., fixed, comp., 3.9K, ±5%, 1/4 W	01121	CS 3925
A6R10	34-5.6K	Res., fixed, comp., 5.6K, ±5%, 1/4 W	01121	CS 5625
A6R11	34-56	Res., fixed, comp., 56 ohms, ±5%, 1/4 W	01121	CS 5635
A6R12	34-220	Res., fixed, comp., 220 ohms, ±5%	01121	CS 2215
A6R13	34-6.8K	Res., fixed, comp., 6.8K, ±5%, 1/4 W	01121	CS 6825
A6R14	34-1K	Res., fixed, comp., 1K, ±5%, 1/4 W	01121	CS 1025
A6R15	34-12K	Res., fixed, comp., 12K, ±5%, 1/4 W	01121	CS 1235
A6R16	34-82	Res., fixed, comp., 82 ohms, ±5%, 1/4 W	01121	CS 8235
A6R17	34-68	Res., fixed, comp., 68 ohms, ±5%, 1/4 W	01121	CS 6835
A6R18 and A6R19	34-1K	Res., fixed, comp., 1K, ±5%, 1/4 W	01121	CS 1025
A6R20	34-10K	Res., fixed, comp., 10K, ±5%, 1/4 W	01121	CS 1035
A6R21	34-56K	Res., fixed, comp., 56K, ±5%, 1/4 W	01121	CS 5635
A6R22	34-4.7K	Res., fixed, comp., 4.7K, ±5%, 1/4 W	01121	CS 4725
A6R23	34-1.2K	Res., fixed, comp., 1.2K, ±5%, 1/4 W	01121	CS 1225
A6R24	34-56	Res., fixed, comp., 56 ohms, ±5% 1/4 W	01121	CS 5635
A6R25	34-56K	Res., fixed, comp., 56K, ±5%, 1/4 W	01121	CS 5635
A6R26	34-15K	Res., fixed, comp., 15K, ±5%, 1/4 W	01121	CS 1535
A6R27	34-4.7K	Res., fixed, comp., 4.7K, ±5%, 1/4 W	01121	CS 4725
A6R28	71-95	Res., variable, wirewound, 10 turn, 2K, ±10%, 1W	21030	79PR2K
A6R29	34-2.2K	Res., fixed, comp., 2.2K, ±5%, 1/4 W	01121	CS 2225
A6R30	34-10K	Res., fixed, comp., 10K, ±5%, 1/4 W	01121	CS 1035
A6R31	34-4.7K	Res., fixed, comp., 4.7K, ±5%, 1/4 W	01121	CS 4725
A6R32	34-1.8K	Res., fixed, comp., 1.8K, ±5%, 1/4 W	01121	CS 1825
A6R33	34-2.2K	Res., fixed, comp., 2.2K, ±5%, 1/4 W	01121	CS 2225
A6R34	34-15K	Res., fixed, comp., 15K, ±5%, 1/4 W	01121	CS 1535
A6R35	34-8.2K	Res., fixed, comp., 8.2K, ±5%, 1/4 W	01121	CS 8225
A6R36	34-1.8K	Res., fixed, comp., 1.8K, ±5%, 1/4 W	01121	CS 1825
A6R37	34-330	Res., fixed, comp., 330 ohms, ±5%, 1/4 W	01121	CS 3315
A6R38	34-560	Res., fixed, comp., 560 ohms, ±5%, 1/4 W	01121	CS 5615
A6R39	34-1K	Res., fixed, comp., 1K, ±5%, 1/4 W	01121	CS 1025
A6R40	34-5.6K	Res., fixed, comp., 5.6K, ±5%, 1/4 W	01121	CS 5625
A6R41	34-1.5K	Res., fixed, comp., 1.5K, ±5%, 1/4 W	01121	CS 1525
A6R42	34-4.7K	Res., fixed, comp., 4.7K, ±5%, 1/4 W	01121	CS 4725
		TRANSFORMERS		
A6T1	91-218	Transformers, RF, Balanced	23880	(Suggested)
		FERRITE BEAD		
A6Z1	191-53	Ferrite Bead	02114	5659065/3B

A8 MIXER ASSEMBLY

CIRCUIT REFERENCE	ALFRED PART NO.	DESCRIPTION	TRUE MFR. FSC NO.	TRUE MFR. PART NO.
A8A1	952070	Mixer Crystal Mt. Assembly (includes mixer diode)	03782	952070
	951816	Probe Assembly	03782	951816
	951818	Conductor Assembly	03782	951818
	951821	Waveguide Assembly	03782	951821
	191-53	Ferrite Bead	03782	191-53

ELECTRICAL CHASSIS PARTS

CIRCUIT REFERENCE	ALFRED PART NO.	DESCRIPTION	TRUE MFR. FSC NO.	TRUE MFR. PART NO.
DS1 thru DS6	126-25	Lamp Indicator, 24V, 2 ma	31918	4622
R1	71-163	Res. variable, comp., 250 ohms, ±20%, 1/2 w, linear	44655	CMU251
R2	71-43	Res., variable, comp., 1K, ±20%, 1/2 w, Linear	12697	37 Series
R3		Not used		
R4	34-4.7K	Res., fixed, comp., 4.7K, ±5%, 1/4 w	01121	CS 4725
W1	990275-01	Cable Assembly	03782	990275-01
W2	990275-02	Cable Assembly	03782	990275-02
W3	990275-03	Cable Assembly	03782	990275-03
W4	990275-04	Cable Assembly	03782	990275-04
W5	990275-05	Cable Assembly	03782	990275-05

ELECTRICAL CHASSIS PARTS

CIRCUIT REFERENCE	ALFRED PART NO.	DESCRIPTION	TRUE MFR. FSC NO.	TRUE MFR. PART NO.
W6	990275-06	Cable Assembly	03782	990275-06
W7	990275-07	Cable Assembly	03782	990275-07
W8	990275-08	Cable Assembly	03782	990275-08

MECHANICAL CHASSIS PARTS

CIRCUIT REFERENCE	ALFRED PART NO.	DESCRIPTION	TRUE MFR. FSC NO.	TRUE MFR. PART NO.
	171-45	Knob	03782	171-45
	176-8	Handle	03782	176-8
	394-6	Foot, Support	03782	394-6
	906184	Front Panel	03782	906184
	906398	Bottom Cover	03782	906398
	906399	Side Cover	03782	906399
	906288-02	Front Trim Extrusion	03782	906288-02
	906424	Top Cover	03782	906424
	191-135	Card Guides	03782	191-135
	906188	Chassis Left Side	03782	906188
	906189	Chassis Right Side	03782	906189
	906289-02	Front Support Extrusion	03782	906289-02
	906290-02	Rear Support Extrusion	03782	906290-02
	906309	Frames, Half Rack, Top & Bottom	03782	906309

FEDERAL SUPPLY CODE FOR TRUE MANUFACTURERS

FMC NO.	Full Name and Address of Vendor
00656	Aerovox Corporation, 740 Belleville Ave., New Bedford, Mass.
00686	Film Capacitors, Inc., 100 East 8th Street, Pabsaic, N.J.
00816	Hughes Aircraft Co., Vacuum Div., 500 Superior Ave., Newport Beach, Calif.
00853	Sangamo Electric Co., P.O. Box 128, Pickens, S.C.
00866	Goe Engineering Co., 219-21 S. Mednik Ave., Los Angeles, Calif.
01121	Allen Bradley Co., 136 W. Greenfield Ave., Milwaukee, Wisc.
01281	Pacific Semiconductor Co., 10451 W. Jefferson Blvd., Culver City, Calif.
01456	Microwave Development Laboratories, 87 Crescent Road, Needham Heights, Mass.
01963	Cherry Electrical Products Corp., Box 439, Highland Park, Ill.
02111	Spectrol Electric Corporation, 17070 E. Gale Ave., City of Industry, Calif. 91745
03508	G.E. Semiconductor, Electronics Park, Syracuse, N.Y., 13201
03565	Dayton Electronic Products Co., 117 E. Helena St., Dayton, Ohio
03782	Alfred Electronics, 3176 Porter Drive, Palo Alto, California 94304
04009	Arrow-Hart, & Hegeman Elec. Co., 113 Hawthorne St., Hartford, Conn.
04713	Motorola Semiconductor Products, Inc., P.O. Box 955, Phoenix, Arizona
05783	Stewart Engineering Co., 467 Bean Creek Rd., Santa Cruz, Calif.
05820	Wakefield Engineering Inc., 139-T Foundry St., Wakefield, Mass.
06049	Topaz, 3802 Houston, San Diego, California 92110
06555	Beede Electrical Instrument Co., Inc., Penacock, N.H.
06980	Varian, 611 Hansen Way, Palo Alto, Calif. (BWO)
02735	Radio Corp. of America, Electronic Components & Devices, 415 S. 5th St. Harrison, N.J.
07137	Transistor Electronics Corp., Box 6191, Minneapolis, Minn.
07263	Fairchild Semiconductor, 545 Whisman Rd., Box 880, Mountain View, Calif.
08806	General Electric Corp., Min. Lamp Dept., Nela Park, Cleveland, Ohio
09022	Comell-Dubilier, 50 Paris St., Newark, N.J. (Mica Caps)
09023	Cornell-Dubilier, 50 Paris St., Newark, N.J. (Electrolytic Caps)
09297	CP Electronics Inc., Columbus, Ind.
11312	Microwave Electronics Div. of Teledyne, 3165 Porter Drive, Palo Alto, Calif.
12060	Diodes, Inc., 9261 Independence Ave., Chatsworth, Calif.
12122	Astrodyne, Inc., 2nd Ave., NW. Ind. Park, Burlington, Mass. 01803
12360	Albany Products, 351 Connecticut Ave., South Norwalk, Conn.
12697	Clarostat Mfg. Co., Washington St., Dover, N.H.
13664	Workman Elec. Prod. Inc., Packing House Rd., Sarasota, Florida 33578
13862	Alasco Rubber & Plastic Corp., 839 Malcom Rd., Burlingame, Calif.
14026	Spatron, Inc., 715 S. Raymond Ave., Alhambra, California 91803
14433	International Telephone & Telegraph, 3301 Electronic Way, W. Palm Beach, Florida
14482	Watkins-Johnson Co., 3333 Hillview, Palo Alto, California
15582	Bay City Screw & Bolt Co., 601 Industrial Way, San Carlos, Calif.
15818	Amelco, 1300 Terra Bella, Mt. View, Calif. 94042
16299	Corning Glass Works, Electronic Products Div., 3906 Electronics Dr., Raleigh, N.C.
16741	Triad Dist. Div. (Litton Ind.) 305 N. Briant St., Huntington, Ind.
17474	Tranex, Inc., 1599 Stierlin Rd., Mountain View, California
17545	Atlantic Semiconductors, Inc., 905 Mattison Ave., Asburg Park, N.J. 07712
17920	Warnecke Electron Tubes, 175 W. Oakton St., Des Plaines, Ill.
18489	Reliable Capacitors Co., 14716 Arminta St., Van Nuys, Calif.
18915	Birtcher Corp., The Industrial Div., 745 S. Monterey Pass Rd., Monterey Park, Calif.
19701	Electra Mfg. Co., 800 North 21, Independence, Kansas
20286	Daytron, Inc., 1269 Terra Bella, Mountain View, California
20649	Universal Metal Products, 5924 N. Western Ave., Chicago 45, Ill.
21030	Beckman Instrument, Inc., Helipot Div., 2500 Harbor Blvd., Fullerton, California
21743	Canseat Corp., 4164 Greenbush Ave., Sherman Oaks, Calif.
22229	Union Carbide, KEMET Elect. Div., Mountain View, California
23880	Standford Applied Engineering, 340 Martan Ave., Santa Clara, Calif.
24220	Gowanda, 179 Broadway Rd., Gowanda, N.Y.
24796	Parelco, Inc., 26181 Avenida Aevoprierto, San Juan Capistrano, California
27014	National Semi-Conductor Corp., 2950 San Ysidro Way, Santa Clara, Calif.
28480	Hewlett-Packard, Paeco Div., 3215 Porter Drive, Palo Alto, California
31918	International Electronics Exchange, 6529 Cambridge St., Minneapolis, Minn. 55426
33173	General Electric Corporation., Tube Dept., 316 E. Ninth St., Owenboro, Ky.
33293	Intersil Inc., Cupertino, Calif.
35434	Lectrohm, Inc., 5560 Northwest Hwy., Chicago, Ill.
37942	Mallory Capacitor Co., Div. P.R. Mallory & Co., Inc., 3029 E. Washington St., Indianapolis, Ind.
42190	The Muter Co., 1255 S. Michigan Ave., Chicago 5, Ill.
42498	National Radio Co., Melrose, Mass.
44655	Ohmite Mfg., Co., 3635 W. Howard St., Skokie, Ill.
46384	Penn Engineering, West State St., Doylestown, Penn.
56289	Sprague Electric Co., 91 Marshall St., N. Adams, Mass.
59730	Tyrap, C/O Thomas & Betts Co., 645 Phelps St., San Francisco, California
70309	Allied Control Co., Inc., 2 East End Ave., New York, New York
70563	Amperite Co., Inc., 600 Palisade Ave., New Jersey
70903	Belden Mfg. Co., Box 5070-A, Chicago, Ill. 60644
71436	Chicago Condenser Corporation, 3253 Armitage Ave., Chicago, Ill. 60647
71450	CTS Corp., 1172 W. Beardsley, Elkhart, Ind.
71590	Centralab, Electronics Div., Globe Union, 934 Keefe Ave., Milwaukee, Wisconsin
71785	Cinch Mfg. Co., 1026 S. Homan Ave., Chicago 24, Ill.
71895	Delavan Mfg. Co., Electro-Sonics Div., West Des Moines, Iowa
72982	Erie Technological Products, Inc., 644 W. 12th St., Erie, Penn.
72012	M. Ducommun Mfg. Co., 580 Fifth Ave., New York , New York 90036
72136	Electro Motive Mfg. Co., Inc., S. Park & John Streets, Williamantic, Conn.
72765	Drake Mfg. Co., 4626 N. Olcott Avenue, Harwood Heights, N.Y. 60656
72983	Stancor Electronics (Essex Wire Corp.) 3501 W. Addison St., Chicago, Ill.
73293	Hughes Aircraft Co., Elec. Comp., Div., 500 Superior Ave., Newport Beach, Calif.
73445	Amperex Electronic Corporation, Box 418, 230 Duffy Ave., Hicksville, N.Y.
73899	JFD Elect. Co., Comp. Div., 15th Ave., at 62nd St., Brooklyn, N.Y.
74542	Hoyt Electrical Inst. Works, Inc., 42 Carleston St., Cambridge, Mass.
74868	Amphenol Corp., Connector Div., 1830 S. 54th Ave., Chicago, Ill.
74970	The E.F. Johnson Co., 1923 10th Ave., S.W. Waseca, Minn.
75376	Kurz Kasch, 1417 S. Broadway, Dayton, Ohio
75382	Kulka Electric Corp., 520 S. Fulton Ave., Mt. Vernon, N.Y.
75042	IRC, Inc., 401 N. Broad St., Philadelphia, Penn.
75497	Lamson & Sessions, 5002 Tiedeman Rd., Cleveland, Ohio
75915	Littlefuse, Inc., 800 E. Northwest Hwy., Des Plaines, Ill.
76433	General Instrument Corp., 65 Gouverneur, Newark, N.J.
76487	James Millen Mfg. Co., Inc., 150 Exchange St., Malden, Mass.
76854	Oak Mfg. Co., Crystal Lake, Ill.
77342	Potter & Brumfield, Div., American Machine & Foundry Co., 1200 E. Broadway, Princeton, Ind.
77557	Reliable Spring & Wire Forms Co., 3167 Fulton Rd., Cleveland, Ohio
78553	Tinnerman Co., Dept. 16-T, P.O. Box 6688, Cleveland, Ohio
78947	Ucinite Corporation, 459 Watertown St., Newtonville, Mass. 02160
79493	J.W. Miller Co., 5915 S. Main St., Los Angeles, Calif. 90003
80294	Bourns, Inc., 1200 Columbia Ave., Riverside, California 92507
81073	Grayhill, Inc., 569 Hillgrove Ave., La Grange, Ill.
81312	Winchester Electronics, Inc., Div. Litton Industries, 19 Willard Rd., Norwalk, Conn.
82389	Switchcraft, Inc., 5555 N. Elston Ave., Chicago 30, Ill.
83186	Victory Engineering, 128 Springfield Ave., Springfield, New Jersey
83701	Electronic Devices, Inc., 21 Grey Oaks Ave., Yonkers, N.Y.
88245	USECO, Div. of Litton Industries, 13536 Saticoy St., Van Nuys, Calif.
89536	John Fluke Mfg. Co., Inc., P.O. Box 7428, Seattle, Wash.
91278	Stoesser Tool & Die, 3366 Fayette Dr., Mountain View, California
91418	Radio Materials Co., 4242 W. Bryn Mawr Ave., Chicago 46, Ill.
91637	Dale Electronics, Inc., (Subs. Lionel Corp.), Box 609, 1342 - 28th St., Columbus, Nebr.
91737	Gremar Mfg. Co., Wakefield, Mass.
91755	Harrison & Bonini, 1122 Harrison St., San Francisco, California
91827	K & F Tool Die & Mfg. , Inc., 1203 Dell Ave., Campbell, California
93332	Sylvania Electric Products, Inc., Semiconductor Div., 100 Sylvan Rd., Woburn, Mass.
93389	Proto Stamping, Washington & Santa Fe, Los Angeles 54, Calif.
94144	Raytheon, 465 Centre St., Quincy, Mass. 02164
94375	Automatic Metal Products Corp., 323 Berry St., Brooklyn 11, N.Y.
95263	Leecraft Mfg. Co., Inc., 44-35 - 21st St., Dept. E., Long Island City, N.Y.
95354	Methode Electronics, Inc., 7447 W. Wilson Ave., Chicago, Ill.
95987	Weckesser Co., Inc., 4444 W. Irving Park, Chicago, Ill.
96214	Texas Instruments, Inc., Semiconductor-Components Div., Box 5012, Dallas, Texas
96791	Borg Electronics, Div., Amphenol-Borg Electronics Corp., 120 S. Main St., Janesville, Wisc.
97464	Industrial Retaining Ring Co., 57 Cordier St., Irvington, N.J.
99120	Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago, Ill.
99313	Varian, 611 Hansen Way, Palo Alto, California (BWO)
99942	Hoffman Electronics Corp., Semiconductor Div., Box 471, El Monte, California

ADDITIONAL NUMBERS

00929	Microlab/FXR, 10 Micralab Rd., Livingston, N.J.
02114	Ferroxcube Corp. of America, Mt. Marion Rd., Saugerties, N.Y. 12477
02116	Wheelock Signals Inc., 273 Branchport Ave., Long Branch, N.J. 07440
02735	RCA Corp. Solid State & Tube Div., Route 202, Somerville, N.J.
04773	Automatic Electric Co., Wolf Rd. Northlake, Ill. 60164
11870	Melabs, Inc., 3300 Hillview, Palo Alto, Calif. 94304
12598	RLC Electronics, Inc., 25 Martin Pl., Port Chester, N.Y. 10573
13175	Electro-Mechanical Corp., 701 S. Elmer Ave., Sayre, Pa. 18840
18741	High Vacuum Electronics, Inc., 538 Mission St., So. Pasadena, Calif. 91030
23095	Aztec Electronics, Inc., 163 Liberty Ave., Anaheim, Calif. 92801
24931	Spec. Connector Co., 3560 Madison Ave., Indianapolis, Ind. 46227
26851	Compac Eng. Co., 810 East St., Hollister, Calif. 95023
70318	Allmetal Screw Products Co. Inc., 821 Stewart Ave., Garden City, N.Y.
71707	Cato Coil Co. Inc., Box B, Edgewood Station, Providence, R.I.
73559	Carling Electric Inc., 505 New Park Ave., West Hartford, Conn. 06110
82219	Sylvania Electric Prod., Revg Tube Div., Emporium, Pa.
84411	TRW Capacitor Div., 112 W. 1st St., Ogallala, Nebr.
89110	AMP, Inc., 155 Park St., Elizabethtown, Pa.
92219	Waldom Electronics Inc., 4625 W. 53rd St., Chicago, see 60632.
94696	Magnecraft Electric Co., 5579 N. Lynch Rd., Chicago, Ill. 60630
95348	Gordos Corp., 250 Glenwood Ave., Bloomfield, N.J. 07003
95712	Dage, Franklin, Ind.
98003	Neilson Hdwr. Corp., 770 Weathersfield Ave., Hartford, Conn.
99779	Barnes Dev. Co., 213 W. Baltimore Pike, Lansdowne, Pa. 19050

SECTION VII
SCHEMATIC DIAGRAMS

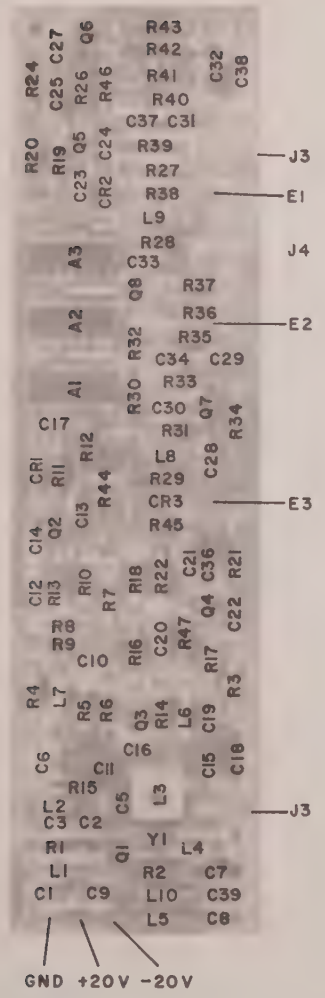
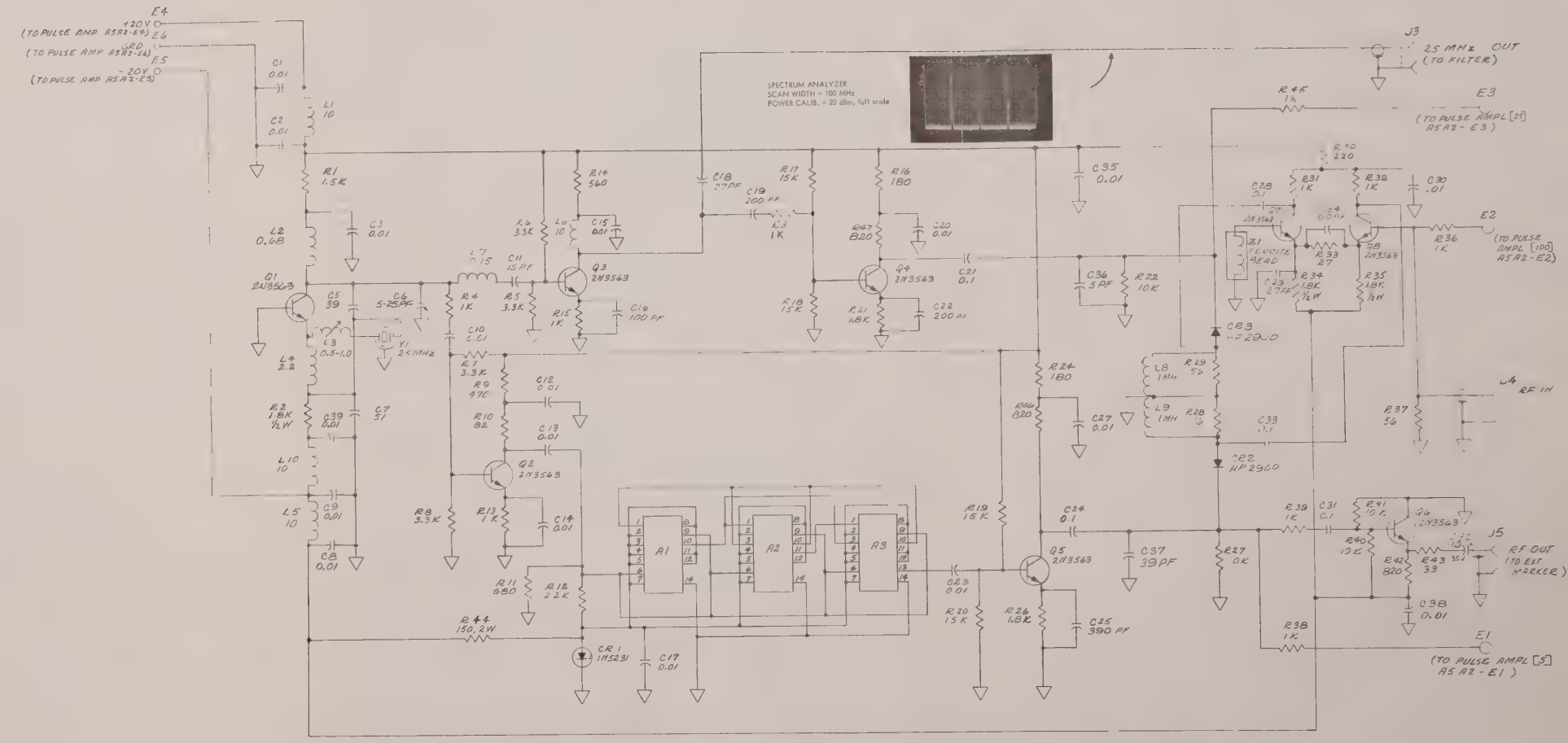


Figure 7-1. Component Identification, 25 MHz Oscillator and Divider Assy, A5A1.



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a. ALL RESISTANCE VALUES IN OHMS, 5%, ¼ W.
   b. ALL CAPACITOR VALUES IN MICROFARADS
   c. ALL INDUCTOR VALUES IN MICROHENRIES

REF DESIGNATIONS		
FIRST	LAST	NOT USED
A1	A3	
C1	C39	C7, 26
CR1	CR3	
L1	L10	
Q1	Q6	
R1	R47	R23, 25
Y1	Y1	
Z1	Z1	

25 MHz OSC. ASSY, A5A1-SER NO 11-D907403

Figure 7-2

25 MHz OSCILLATOR AND DIVIDER ASSY, A5A1

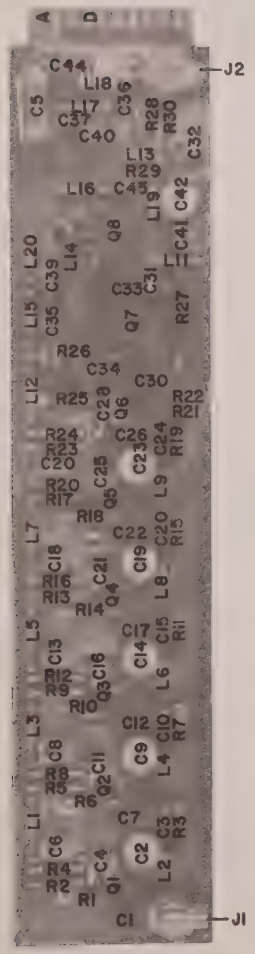
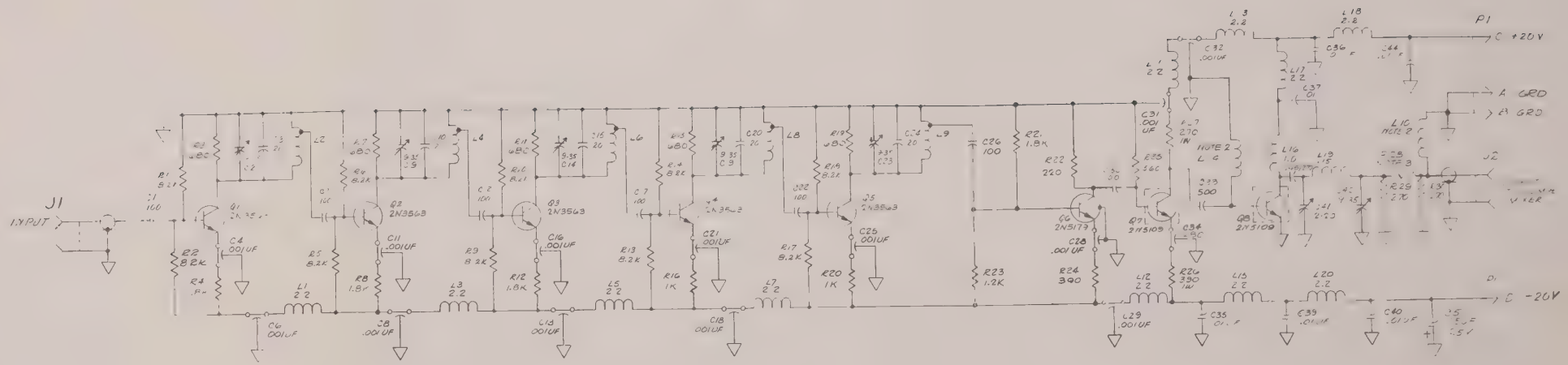


Figure 7-3. Component Identification, 100 MHz Filter and Amplifier Assy, A3.



NOTES
1. UNLESS OTHERWISE SPECIFIED:
   a. ALL RESISTOR VALUES IN OHMS, ± 5%, 1/4 W
   b. ALL CAPACITOR VALUES IN PICOFARADS.
   c. ALL INDUCTOR VALUES IN MICROHENRIES.
2. 3 TURNS AWG 26 ENAMELED ON FERRITE BEAD.
3. FACTORY SELECTED VALUE.

REF DESIGNATIONS		
FIRST	LAST	NOT USED
C1	C44	C29, C32, C43
L1	L20	
Q1	Q8	
R1	R30	

100 MHz FILTER/AMPL ASSY, A3 – SER NO II – 0907394

Figure 7-4

100 MHz FILTER AND AMPLIFIER ASSY, A3

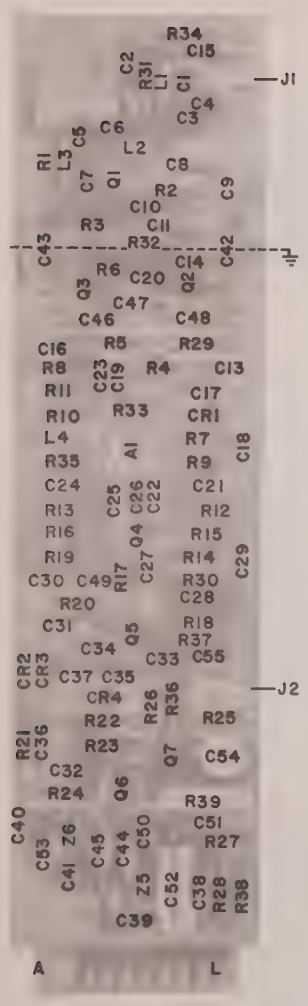
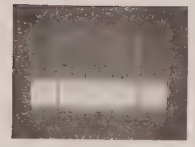


Figure 7-5. Component Identification, Video Amplifier Assy, A4.



SPECTRUM ANALYZER
SCAN WIDTH = 100 MHz
POWER CALIB. = -40 dBm, full scale
RF IN = n (100 MHz) + 20 MHz

SPECTRUM ANALYZER
SCAN WIDTH = 100 MHz
POWER CALIB. = 0 dBm, full scale
RF IN = n (100 MHz) + 20 MHz

J2 OUTPUT

P1
+25 V
L TO SENSITIVITY CONTROL
A GRD
B
-D -20V
K GRD

Z1 FERRITE BEAD
Z2 FERRITE BEAD
Z3 FERRITE BEAD
Z4 FERRITE BEAD
Z5 FERRITE BEAD
Z6 FERRITE BEAD
Z7 FERRITE BEAD
Z8 FERRITE BEAD
Z10 FERRITE BEAD

(FROM MIXER AB)
(SHIELD)

Q1 2N5179
Q2 2N3563
Q3 2N3563
Q4 2N3563
Q5 2N3563
Q6 IT222
Q7 2N3904

A1

CR1 1N459
CR2 HP2900
CR3 HP2900
CR4 1N459

L1 200 NH
L2 200 NH
L3 180 NH
L4 .147

R1 56
R2 3.3K
R3 4.7K
R4 1K
R5 1K
R6 3.9K
R7 330
R8 1.5K
R9 5.6K
R10 330
R11 330
R12 680, ½W
R13 680, ½W
R14 1.2K
R15 820, ½W
R16 1K, ½W
R18 820, ½W
R21 4.7K
R22 5.6K
R23 82
R24 4.7K
R25 2.7K
R26 2.7K
R27 33K
R30 54
R32 47K
R33 47
R34 100
R35 560
R36 39
R37 100
R39 1.8K

C1 4.1
C2 47 PF
C3 27PF
C4 100PF
C5 18 PF
C6 91PF
C7 39PF
C8 1.0 35V
C9 .01
C10 .01
C11 .01
C12 .01
C13 .01
C14 .047
C15 3.9 35V
C16 .01
C17 .001
C18 0.01
C21 1.0 35V
C22 .01
C23 .01
C24 1.0 35V
C25 .01
C26 .022
C27 1.0 35V
C28 4.7 35V
C29 .01
C30 .01
C31 10 35V
C32 .01
C33 0.1
C34 5-60 PF
C35 .01
C36 150 4V
C37 .01
C38 .01
C39 .01
C40 1.0 35V
C41 .01
C42 .001
C43 .001
C44 1.0 35V
C45 1.0 35V
C46, 1.0, 35V
C47, .01
C48 1.0 35V
C49 .001
C50 1.0 35V
C51 1.0 35V
C52 .01
C53 1.0 35V
C54 5-60 PF
C55 47 PF
C56 100 PF
C57 .01
C58 .01
C59 .01
C60 .01
C61 .01
C62 .01
C63 .01
C64 .01
C65 .01
C66 .01
C67 .01
C68 .01

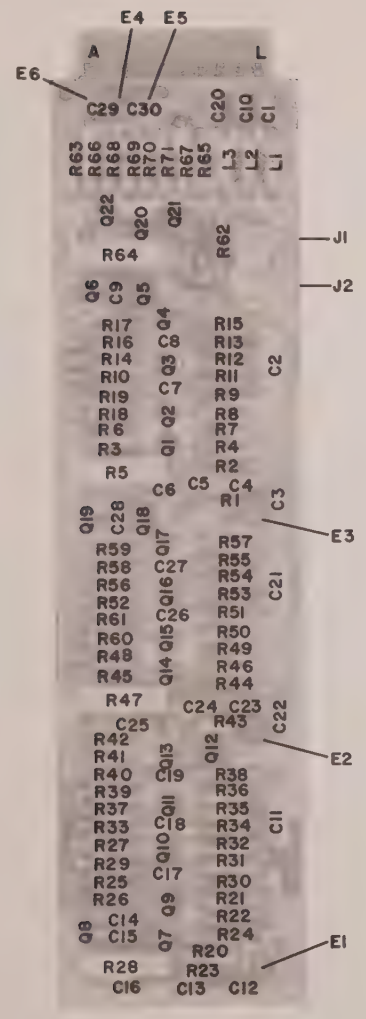
NOTES:
1. UNLESS OTHERWISE NOTED:
ALL RESISTANCE IN OHMS, 5%, ¼ W.
ALL CAPACITANCE IN MICROFARADS.
ALL INDUCTANCE IN MICROHENRIES.

VIDEO AMPL ASSY, A4 - SER NO 11-0907402

REF DESIGNATIONS		
FIRST	LAST	NOT USED
A1	A1	
C1	C68	
CR1	CR4	
L1	L4	
Q1	Q7	
R1	R39	
Z1	Z10	

Figure 7-6

VIDEO AMPLIFIER ASSY, A4



NOTE:
1. UNLESS OTHERWISE SPECIFIED:
ALL RESISTOR VALUES IN OHMS, ± 5%, ¼ W
ALL CAPACITOR VALUES IN MICROFARADS

PULSE AMPL ASSY, A5A2 - SER NO II-D907405

REFERENCE DESIGNATIONS		
FIRST	LAST	NOT USED
C1	C30	
L1	L3	
Q1	Q22	
R1	R71	

Figure 7-7. Component Identification, Pulse Amplifier Assy, A5A2.

Figure 7-8

PULSE AMPLIFIER ASSY, A5A2

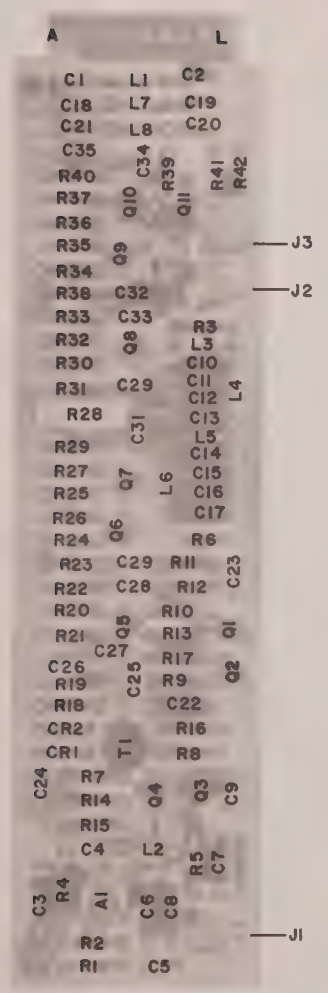
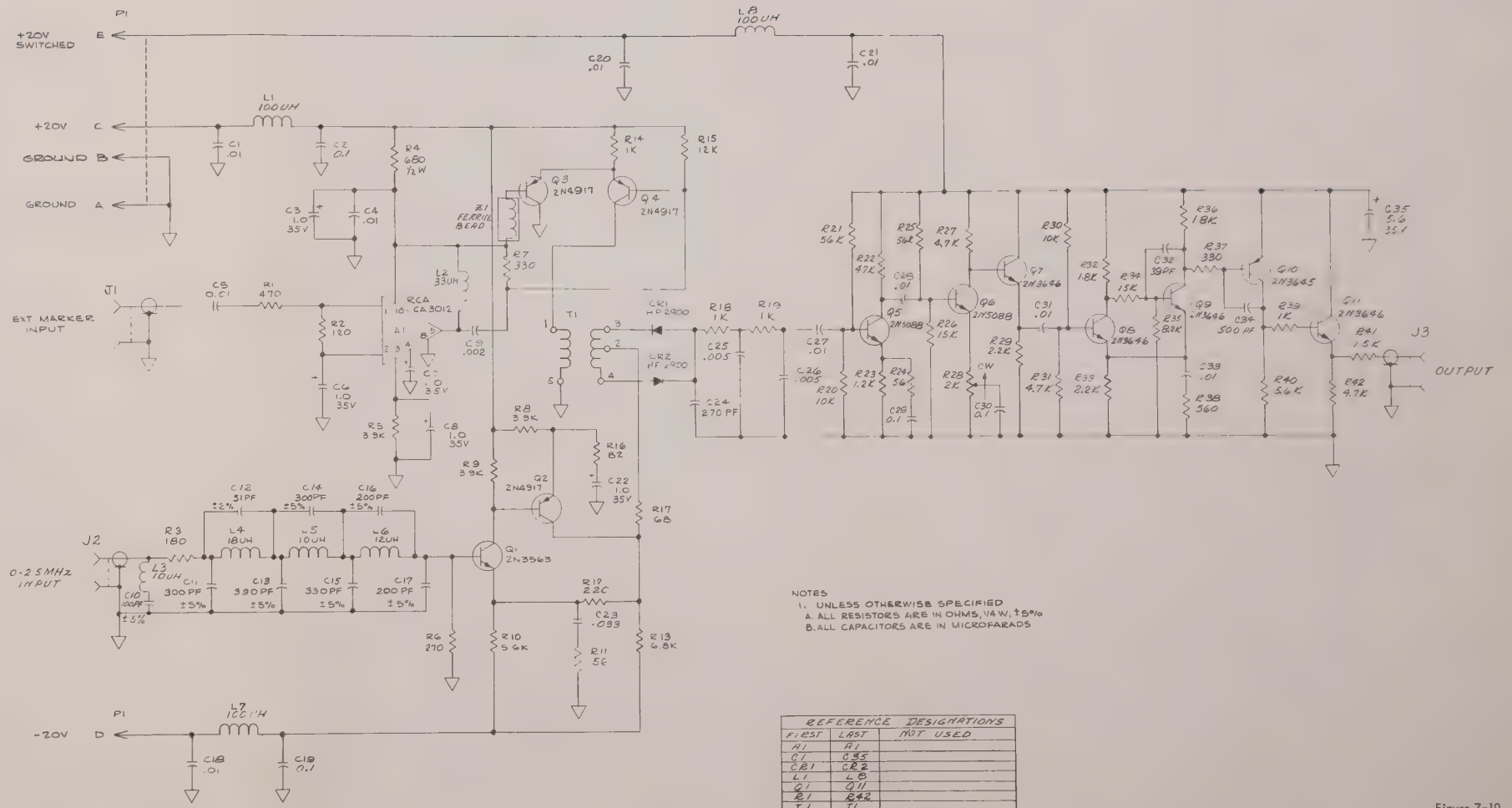


Figure 7-9. Component Identification, External Marker Assy, A6.



NOTES
1. UNLESS OTHERWISE SPECIFIED
   A. ALL RESISTORS ARE IN OHMS, ¼ W, ±5%
   B. ALL CAPACITORS ARE IN MICROFARADS

REFERENCE DESIGNATIONS		
FIRST	LAST	NOT USED
A1	A1	
C1	C35	
CR1	CR2	
L1	L8	
Q1	Q11	
R1	R42	
T1	T1	
Z1	Z1	

EXT MARKER ASSY, A6-SER NO. 11-0907404

Figure 7-10

EXTERNAL MARKER ASSY, A6

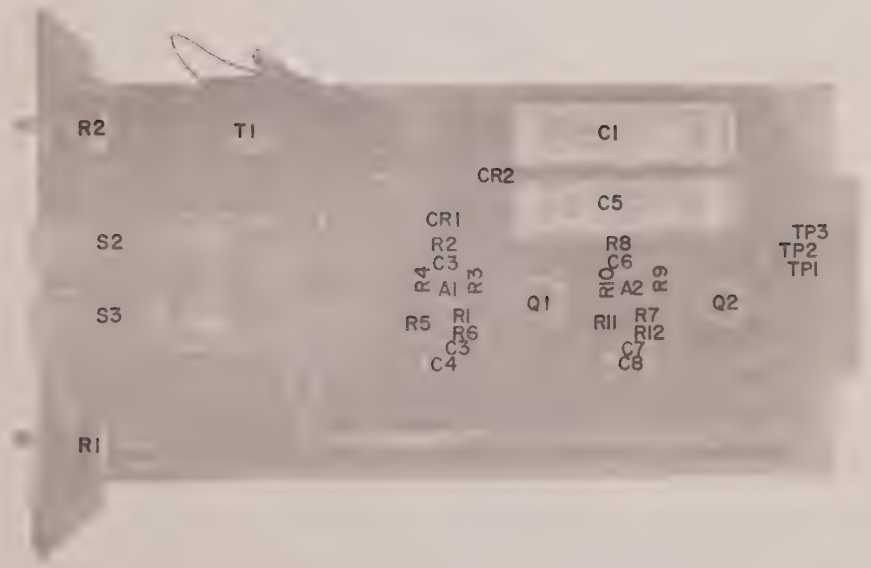
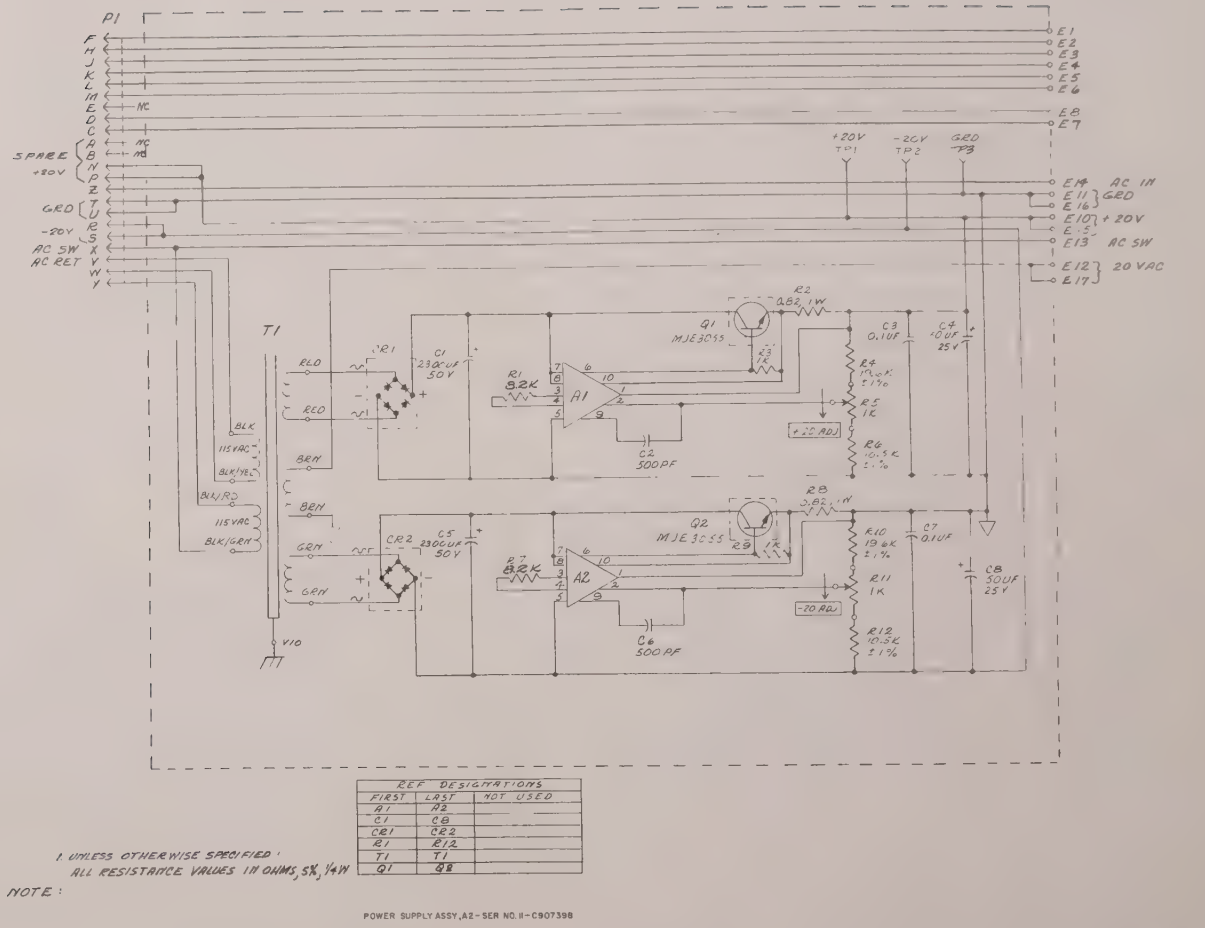


Figure 7-11. Component Identification, Power Supply Assy, A2.



REF DESIGNATIONS		
FIRST	LAST	NOT USED
A1	A2	
C1	C8	
CR1	CR2	
R1	R12	
T1	T1	
Q1	Q2	

NOTE:
1. UNLESS OTHERWISE SPECIFIED:
ALL RESISTANCE VALUES IN OHMS, 5%, 1/4W

POWER SUPPLY ASSY, A2 - SER NO. II-C907398

Figure 7-12

POWER SUPPLY ASSY, A2

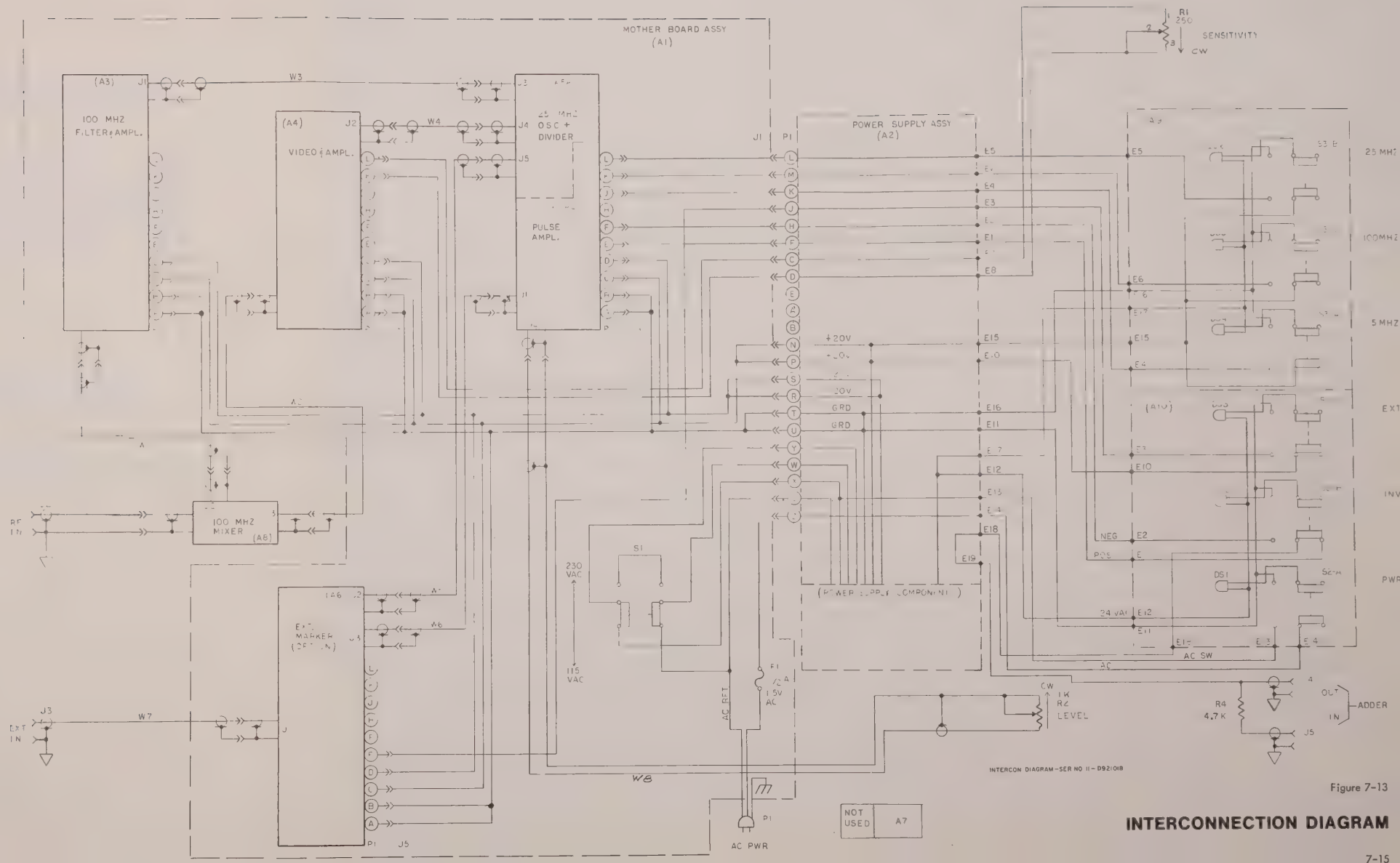


Figure 7-13

INTERCONNECTION DIAGRAM

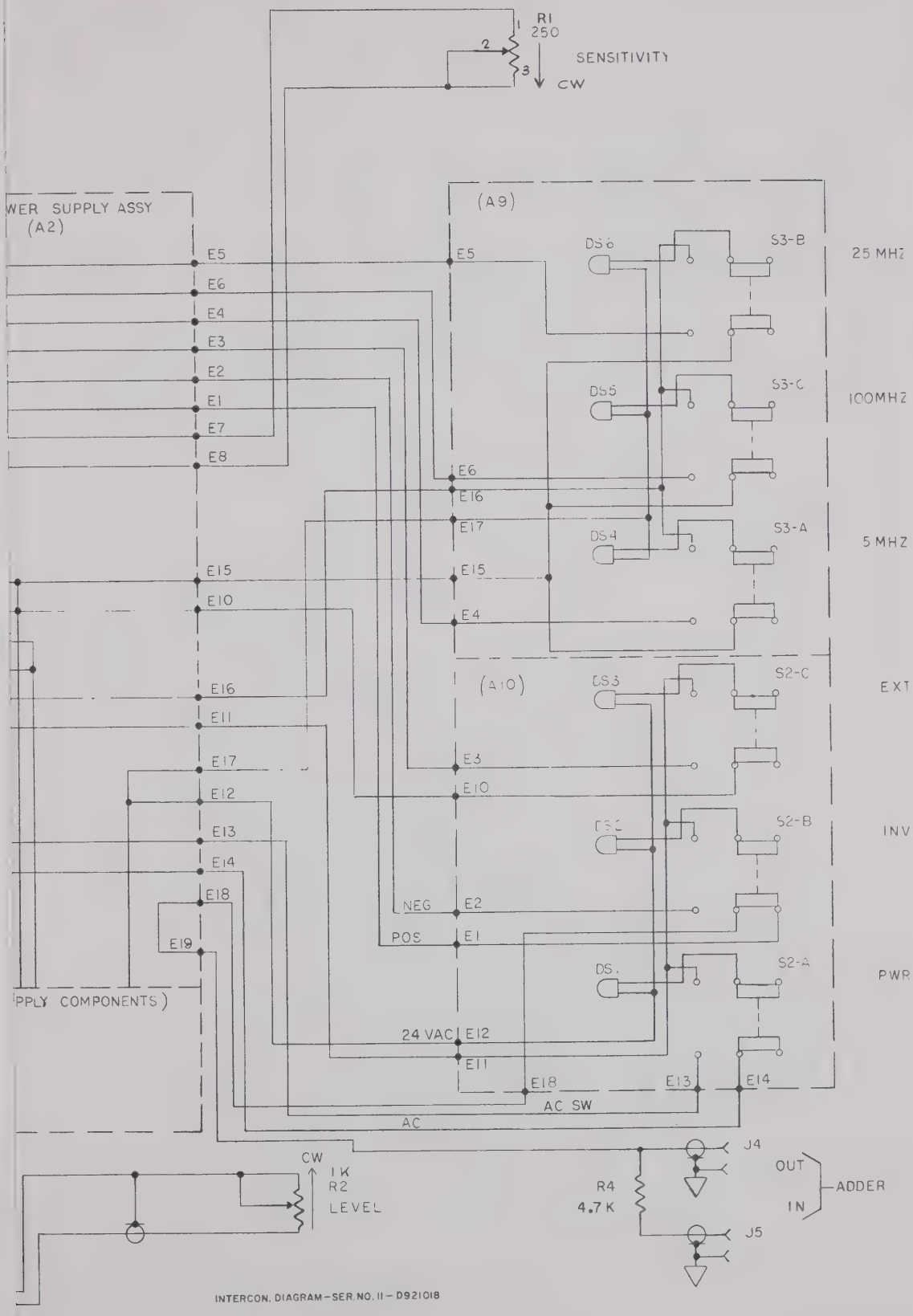


Figure 7-13

INTERCONNECTION DIAGRAM

SHIPMENT DAMAGE CLAIM

The instrument should be tested as soon as it is received. If it fails to operate properly or is damaged in any way, a claim must be filed with the carrier. Have carrier agent inspect damage to instrument and packing crate and forward us a copy of his written report. You will then be advised of replacement or repair arrangements and disposition of the equipment. Please include model number, type number and serial number when referring to this instrument for any reason.

REPACKING FOR SHIPMENT

The instrument should be packed in the original carton. If unusable or not available, use a wooden box with approximately three inches of excelsior or other shock-absorbing material surrounding the instrument. If desired, packing services of a local transfer and storage company may be employed.

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